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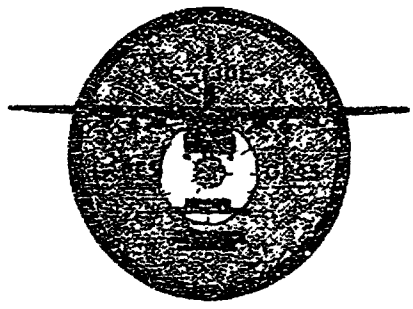
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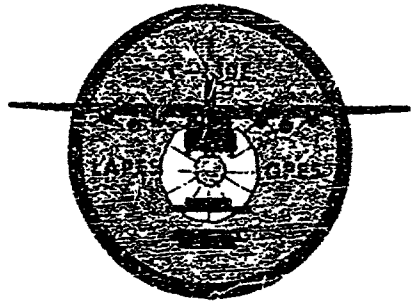
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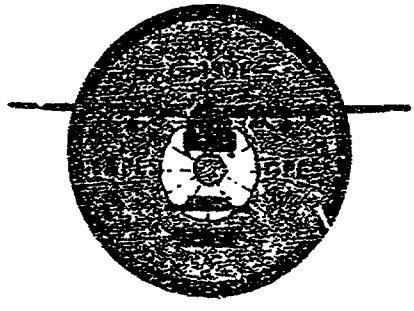


EVALUATION OF THE C-130E STABILITY AND CONTROL CHARACTERISTICS AND THE A/A32H-4 DUAL RAIL CARGO HANDLING SYSTEM DURING LOW LEVEL CARGO DELIVERIES

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FOREWORD

This report presents the results of a series of 75 low altitude extraction tests performed with a C-130E, USAF serial number 64-0560, equipped with an A/A32H-4 Dual Rail Cargo Handling System. These tests were conducted from 28 February to 15 July 1966 at the Naval Air Facility, El Centro, California, by the Directorate of Systems Test, Air Force Flight Test Center (AFFTC), Edwards Air Force Base, California.

There were 48 low altitude parachute extraction system (LAPES) tests conducted under the authority of the AFFTC project directive 66-1, 21 July as amended 13 October 1965, with an AFFTC priority of 01. These LAPES tests were conducted from 28 February to 29 March 1966 and from 18 May to 15 July 1966. There were 27 ground proximity extraction system (GPES) tests conducted from 5 April through 16 May 1966 under the AFFTC project directive 66-4C, 3 March 1966, with an AFFTC priority of 07. The program structure for both LAPES and GPES tests was Project 1528, Task 02. This report contains no classified information. Foreign announcement and dissemination by the Defense Document Center is not authorized because of technology restrictions of the U. S. Export Control Acts as implemented by AFR 400-10.

The authors wish to express their appreciation to Mr. William R. Turley for the analog computer simulation of the C-130E airplane responses resulting from low level deliveries. A discussion of this simulation is presented as Appendix IV of this report.

This technical report has been reviewed and is approved.

16 January 1967

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ABSTRACT

The purpose of these tests was to determine the stability and control characteristics of the C-130E airplane and the suitability of the A/A32H-4 Dual Rail Cargo Handling System while performing low level (ground proximity) cargo deliveries. The test program was conducted in three phases consisting of a total of 48 low altitude parachute extraction system (LAPES) deliveries and 27 ground proximity extraction system (GPES) deliveries from 28 February through 15 July 1966. The maximum single and total sequential load LAPES deliveries executed were approximately 25 000 and 28 000 pounds, respectively. The maximum GPES delivery was 25 000 pounds. No unsatisfactory airplane stability and control characteristics were encountered during the single and sequential load LAPES and single load GPES deliveries at airspeeds above 1.2 times the power-off stall speed. All Dual Rail Cargo Handling System structural loads recorded were well below the design limits of the system. It is recommended that the C-130E airplane and A/A32H-4 Dual Rail Cargo Handling System be cleared for LAPES and GPES deliveries of up to 25 000-pound single load weight, providing the extraction system used provides at least 2000 pounds of extraction force for an 18 000-pound load and 5000 pounds for a 25 000-pound load. The ranges of the airplane gross weight and center of gravity during the LAPES and GPES deliveries presented no unsatisfactory airplane handling characteristics. Airplane speeds between 120 percent of the power-off stalling speed and 130 KIAS are recommended for LAPES and GPES deliveries. However, the ground-speed limit of 130 knots on the GPES equipment must be observed. Recommendations for clearance of sequential LAPES will be made in future AFFTC reports based on additional tests not covered in this report. Extraction zone lengths were found to be 2120 feet from a 50-foot height on descent to a 50-foot height on climb with a 100 000-pound airplane at 130 KIAS for a GPES delivery. The distance required to perform a single LAPES delivery after descending from a 100-foot height and climbing to a 50-foot height was 3170 feet. The above distances were based on a standard day at sea level with military power and 20 degrees of airplane pitch attitude being used in climbout. The climbout distances after extraction placed in the Flight Manual should be based on airplane performance with the load still on board for both GPES and LAPES. In the event a drogue parachute release device is not incorporated in the system, the LAPES climbout distances should be based on airplane performance while towing the drogue parachute. The variable-restraint lock settings as listed in table 4B-2, T.O. 1C-130A-9, for the A/A32H-4 Dual Rail Cargo Handling System were found to be inadequate to insure against inadvertent or premature platform release during LAPES and GPES missions. As a result of these tests, a new table of lock settings has been developed and is included in this report for LAPES and GPES missions. It was found that the use of equal settings for all engaged locks provided a more reliable and more uniform restraint for the load. The lock setting table was devised for a maximum of five locks set at an equal value because platform rail tolerances prevented effective use of more than five locks. The procedures for use of the lock calibrator were unsatisfactory and revised procedures are included in appendix III.

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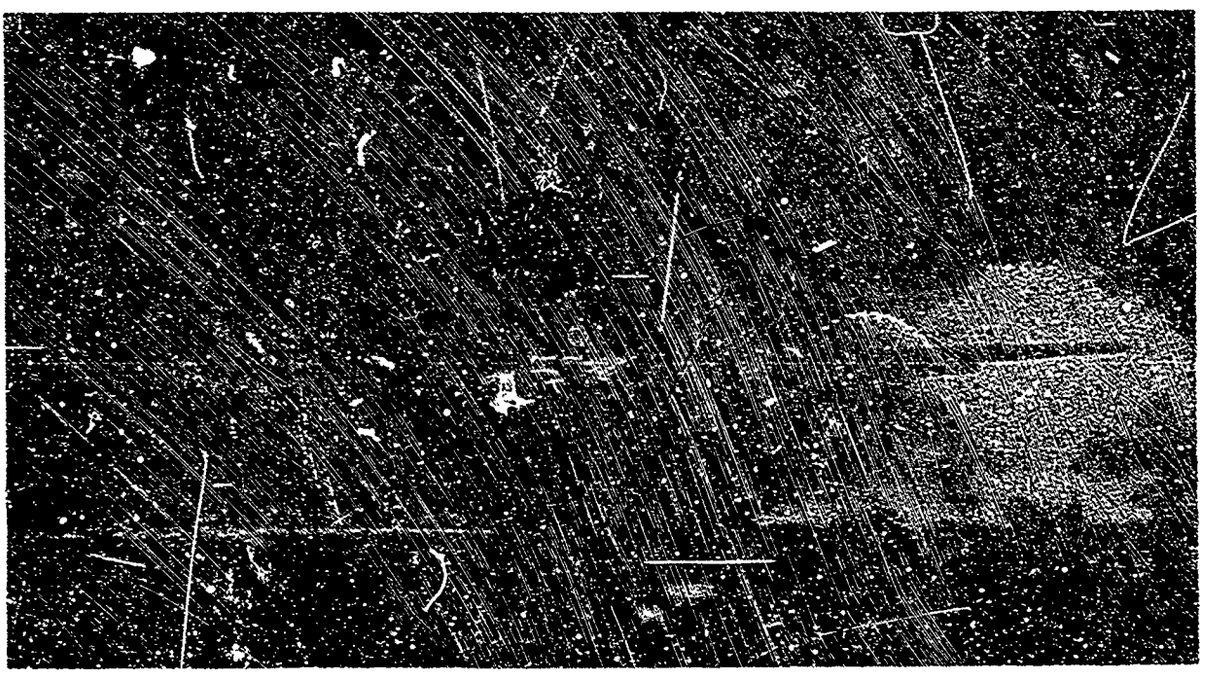
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LIST OF ABBREVIATIONS AND SYMBOLS

Symbol	Definition	Units
AAE	All American Engineering Company	---
ADS	Aerial Delivery System	---
AFFTC	Air Force Flight Test Center	---
AFR	Air Force Regulation	---
alt	altitude	---
AND	airplane nosedown	---
ANL	airplane nose left	---
ANR	airplane nose right	---
ANU	airplane noseup	---
ASD	Aeronautical Systems Division	---
B.O.	breakout	---
C	centigrade	---
cg	center of gravity	pct MAC
deg	degrees	---
dia	diameter	---
dn	down	---
DRCHS	Dual Rail Cargo Handling System	---
D_o	diameter of parachute at skirt	ft
ER	extraction ratio (extraction force/ load weight)	dimensionless
Extr.	Extraction	---
F_e	longitudinal control wheel force	lb
fps	feet per second	---
g	acceleration	ft/sec^2
GPES	ground proximity extraction system	---
hp	horsepower	---
in.	inch	---
K	Kelvin	---
KCAS	knots calibrated airspeed	---
KEAS	knots equivalent airspeed	---
KIAS	knots indicated airspeed	---
kt	knot	---

LAPES	low altitude parachute extraction system	---
lb	pound	---
lt	l [illegible]	---
LWD	left wing down	---
MAC	mean aerodynamic chord	---
min	minute	---
MRP	military rated power	---
NACA	National Advisory Committee for Aeronautics	---
N_x	airplane cg longitudinal acceleration	g
N_z	airplane cg normal acceleration	g
pct	percent	---
R/C	rate of climb	ft/min
rpm	revolutions per minute	---
RS, rs	ring slot	---
RS', rs'	ring sail	---
rt	right	---
RWD	right wing down	---
sec	second	---
SEP	separation	---
shp	engine shaft horsepower	---
sq	square	---
temp	temperature	---
TIT, T_{t_5}	turbine inlet temperature	deg C, deg K
T.O.	Technical Order	---
U. S.	United States	---
USAF	United States Air Force	---
V_{ic}	indicated airspeed corrected for instrument error	kt
V_s	airplane power off stall speed	kt
wt	weight	---
α	airplane angle of attack	deg
β	airplane angle of sideslip	deg
Δ	differential	---
δ_a	aileron position	deg

δ_e	elevator position	deg
δ_r	rudder position	deg
δ_{t_2}	engine compressor inlet pressure/standard sea level pressure	dimensionless
θ	airplane pitch angle	deg
$\dot{\theta}$	airplane pitch rate	deg/sec
θ_{t_2}	engine compressor inlet temperature T_{t_2} deg K/288.16 deg K	dimensionless
σ	air density ratio	dimensionless
ϕ	airplane bank angle	deg
$\dot{\phi}$	airplane roll rate	deg/sec
ψ	airplane yaw angle	deg
$\dot{\psi}$	airplane yaw rate	deg/sec



INTRODUCTION

The purpose of these tests was to determine the stability and control characteristics of the C-130E airplane and the suitability of the A/A32H-4 cargo handling system while performing low altitude (ground proximity) cargo deliveries. This report presents the results of these tests. A description of the test phases is presented in table I. Because load survivability was not an objective of these tests and loads delivered were not representative of operational loads, no efforts were expended in this direction.

The airplane used for these tests was essentially a production C-130E as described in the C-130E Flight Manual (reference 1), except that the airplane was equipped with an A/A32H-4 Dual Rail Cargo Handling System (DRCHS) and an airborne data acquisition system. The rail system is described in Technical Order 1C-130A-9 (reference 2). The data acquisition system was installed by the AFFTC for the measurement of airplane stability parameters, pilot control activity, and to acquire rail system test data.

Phase I, ring slot (RS) low altitude parachute extraction system (LAPES)[1], consisted of seven single-platform deliveries of loads ranging in weight from 8000 to 18 000 pounds, and 13 two-platform sequential deliveries of loads ranging in total weight from 16 000 to 28 000 pounds. RS parachutes were used to extract the load platform from the airplane. Data and results of the seven single-platform LAPES deliveries were transmitted to the Aeronautical Systems Division (ASD) in an AFFTC letter report on 22 March 1966, titled Preliminary Evaluation of the Stability and Control Characteristics and of the A/A32H-4 Dual Rail Cargo Handling System During LAPES Deliveries from a C-130E Airplane. Data and results of the 13 two-platform sequential extractions were transmitted to ASD in an AFFTC letter report on 13

[1] LAPES deliveries are intended to be made with the airplane wheels not more than 15 feet above the ground. GPES deliveries are made with the engagement hook in contact with the ground (wheels approximately zero to 5 feet above the ground).

TABLE I

TEST PHASES

Phase	Description	Number of Tests
I	Ring slot single and sequential load (2) LAPES deliveries	20
II	Single load GPES deliveries	27
III	Ring sail single load LAPES deliveries	28*

*Includes seven deliveries from 5000 feet.

The test conditions for these extractions are summarized in tables I through III, appendix I.

April 1966, titled Preliminary Evaluation of the C-130E Stability and Control Characteristics and of the A/A32H-4 Dual Rail Cargo Handling System During Sequential LAPES Deliveries.

Phase II, ground proximity extraction system (GPES), consisted of 27 single-platform deliveries ranging in weight from 6100 to 25 100 pounds. Data and results of the first four GPES tests, ranging in weight from 6250 to 25 000 pounds, were transmitted to ASD in an AFFTC letter report on 29 April 1966, titled Preliminary Evaluation of the C-130E Stability and Control Characteristics and of the A/A32H-4 Dual Rail Cargo Handling System During Ground Proximity Extraction System Deliveries. Data and results of all the GPES tests were transmitted to ASD in an AFFTC letter report on 12 July 1966, titled Evaluation of the C-130E Stability and Control Characteristics and of the A/A32H-4 Dual Rail Cargo Handling System During Ground Proximity Extraction System Deliveries.

Phase III, ring sail (RS') LAPES, consisted of 28 single-platform deliveries of loads ranging in weight from 12 000 to 25 000 pounds. Seven of these extractions were made at an altitude of approximately 5000 feet to observe airplane reactions during simulated parachute failure and subsequent reduced extraction force. Four extractions were made at ground proximity with a fully reefed extraction parachute to simulate paracnute failure. The remaining 17 extractions were made using 32-foot diameter RS' extraction parachute(s) to extract single load platforms at ground proximity. The results of these tests were transmitted to ASD in a letter report, 2 August 1966, titled Preliminary Conclusions and Recommendations of C-130E Stability and Control and A/A32H-4 Dual Rail Cargo Handling System Tests Utilizing the Metric Systems Corporation Low Altitude Parachute Extraction System (LAPES) to Extract Single Loads.

Coordination copies of this report were forwarded to ASD and the Systems Engineering Group on 25 November 1966.

TEST AND EVALUATION

Test Equipment

AIRPLANE AND DATA ACQUISITION SYSTEM

The airplane used for these tests was essentially a production C-130E as described in reference 1, except that it was equipped with an A/A32H-4 DRCHS and an airborne data acquisition system. The main components of the data acquisition system were mounted on a photo-panel table and on an instrumentation equipment table in the forward portion of the cargo compartment. This particular location of the data acquisition system prevented use of the full length of the cargo compartment for extraction loads. A maximum of 32 feet of extraction platforms could be placed in the airplane; however, this was adequate for these tests.

DEAD LOADS AND PLATFORMS

Dead loads ("tubs") were used to simulate actual cargo loads. The tubs used were 8, 11 1/2, and 18 1/2 feet long and were fabricated of plate steel. These tubs were weighted with 500-pound steel plates. Lead weights of 100 and 500 pounds were chained to one side of the tub for the asymmetric load tests. The dead load was placed on

the extraction platform on which one or more 4-inch layers of paper honeycomb had been placed. Figure 3 shows an extraction load as rigged for the PS LAPES tests.

Three types of platforms were used: The Army Modular (Comex) platform consisted of balsa wood sandwiched between thin metal sheets on which aluminum rails were mounted; the "interim" platform, manufactured by Aeronca Corporation, was made of plywood with aluminum stiffeners and side rails; and the third platform was of all-aluminum construction manufactured by the Metric Systems Corporation. Each of the three platform types were available in lengths of 8, 12, 16, and 20 feet.

DUAL RAIL CARGO HANDLING SYSTEM

A DRCHS, USAF Model A/A32H-4, part number 14711-100, manufactured by Brooks and Perkins, Inc., Detroit, Michigan, was designed to provide an aerial delivery capability and expedite handling of palletized cargo for terminal-to-terminal operations of C-130 aircraft. A detailed description of the system can be found in section IVB of reference 2.

Reference 2 used redundant and inconsistent terminology when describing components of the DRCHS. Detent latch assembly was the term used to identify each mechanism provided to prevent fore-aft motion of the palletized cargo. Use of

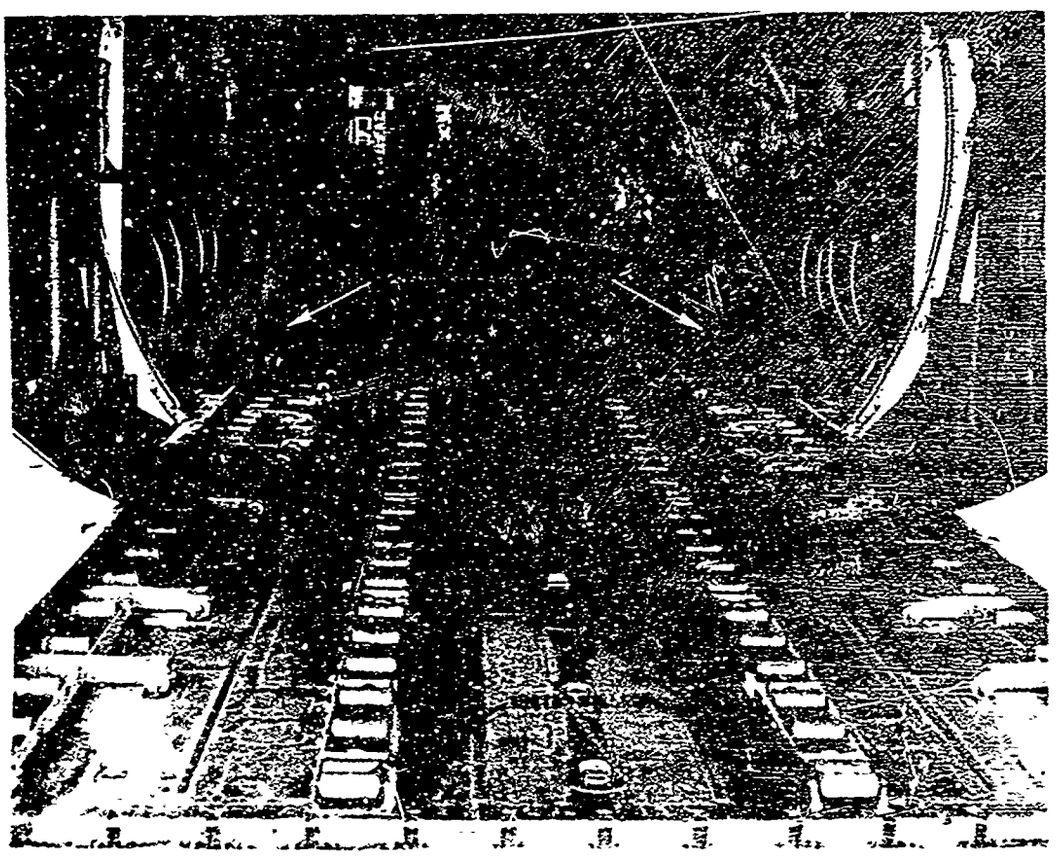


Figure 1 A/A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM

the word lock to identify the mechanism avoided that redundancy in this report. Each lock included a latch which was variously identified as a detent, latch, detent latch, latch detent, or detent body in reference 2. An editorial review of reference 2 should be accomplished. (R 17)[2]

The DPCMS was essentially a roller conveyor which encompassed locking and release mechanisms for securing and/or releasing pallets and modular platforms. It consisted of a total of 12 outboard and 14 intermediate conveyor frame assemblies. The conveyor frame assemblies were mounted on both outboard sides of the aircraft cargo floor and ramp (figure 2). The intermediate conveyors were mounted on the cargo floor and ramp. Vertical and lateral restraint of the cargo platforms was provided by the outboard conveyor frame assembly rails. Rollers in the conveyor frame assemblies provided vertical support for the loaded platforms. Forward and aft restraint was provided by the mechanical locks in the outboard conveyor frame assemblies. Two sets of controls actuated the locking and release mechanisms. One set of controls actuated the left-hand mechanism, and one set actuated the right-hand mechanism (figure 2). The left-hand locks were not adjustable and each provided a forward restraining force of 20 000 pounds and an aft restraining force of 10 000 pounds. There were 11 left-hand locks and 11 right-hand locks in the system. Each right-hand lock had a constant forward restraining force of 20 000 pounds and a variable aft restraining force of 250 to 4000 pounds. The right-hand latches were spring loaded. When the latches were placed in the engaged position, they projected through the rail and mated with the platform indent. The platform was then restrained in the aft direction in proportion to the force loaded into the spring. An adjusting bolt and an indicator cursor were provided on each lock to adjust the desired spring tension to provide latch release at any force between 250 and 4000 pounds. The latches disengaged when the preset force was overcome by an aft directed force (parachute or ground arrestor) on the platform.

PHASE I RING SLOT LAPES

The RS LAPES was utilized as an interim method of extracting loads from the test airplane so that the airplane's stability and control characteristics could be determined. This system was developed for test purposes and was not intended to be used operationally. The RS LAPES is illustrated in figures 3 and 6 and was operated as follows:

1. The RS drogue parachute, which had a diameter at the parachute skirt (D_o) of 15 feet, was deployed by the copilot approximately 10 seconds prior to extraction. This was done by pushing the ADS CHUTE REL button, deploying the parachute from the pendulum parachute ejector.

2. A manually operated knife cutter was activated at extraction by the loadmaster. This cut the drogue parachute restraint line and transferred the drogue parachute force from the drogue restraint pin on the ramp to the 28-foot D_o RS extraction parachute(s), thereby permitting deployment.

3. The parachute extraction force was applied directly

[2] Numbers indicated as (R 17), etc., represent the corresponding recommendation numbers as tabulated in the Conclusions and Recommendation section of this report.

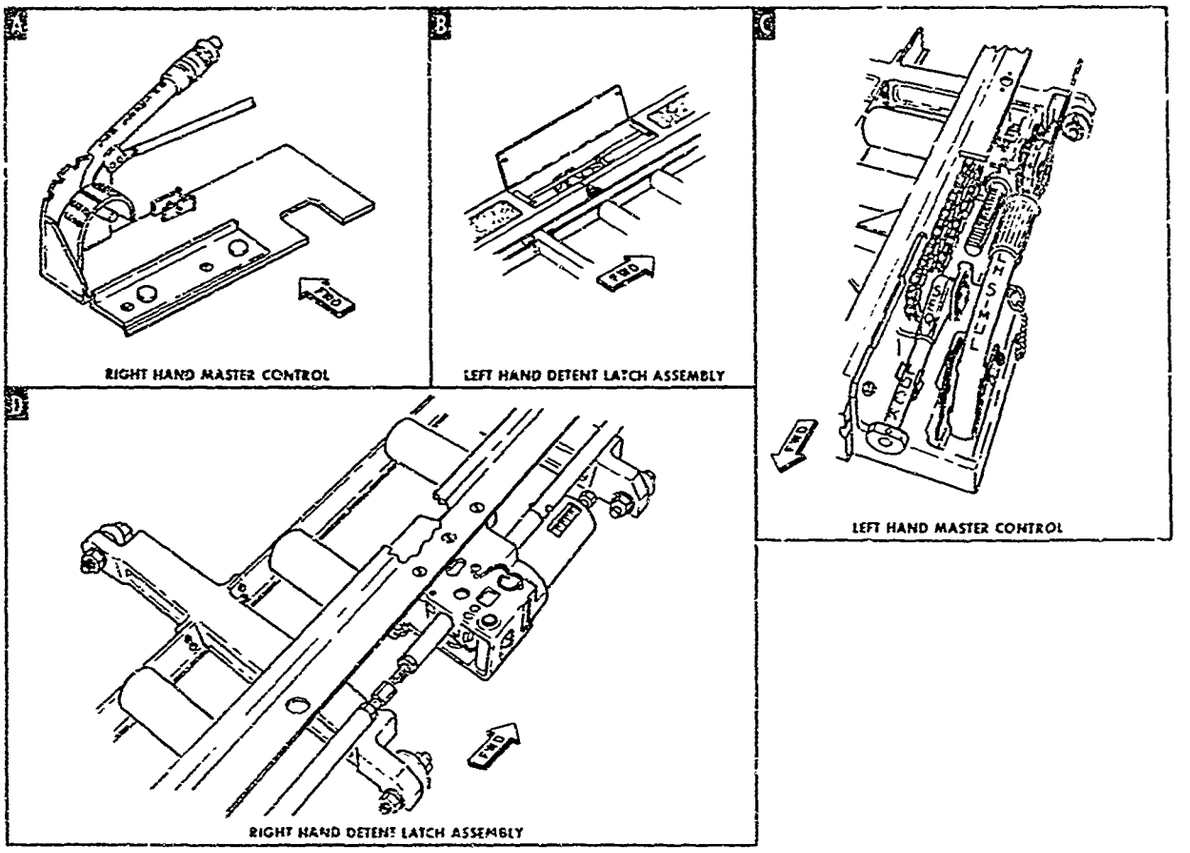


Figure 2 A/A22A-4 DUAL RAIL CARGO HANDLING SYSTEM LOCKS AND CONTROLS

to the test cargo load. When the extraction force exceeded the preset restraint lock force, the cargo load was extracted.

The sequential PS LAPES tests consisted of extracting two cargo loads from the test airplane on one pass. The aft load, or the first load to leave the airplane, was extracted just as the single load described above with the exception that the copilot activated a solenoid-operated knife cutter through a switch installed in the cockpit to transfer the droque parachute force from the droque restraint pin to the extraction parachute. This electrical system was backed up with a knife cutter system that could be manually operated by the loadmaster. The extraction parachute bag(s) for the forward load, the second load to leave the airplane, was mounted on the aft load. When the aft load had been extracted and was approximately 60 feet from the forward load, the parachute(s) for the forward load was separated from its bag(s) and deployed. When the parachute force exceeded the preset lock force on the forward load, the latches released and the load was extracted.

PHASE II GPES

The equipment used for the GPES tests was manufactured by the All American Engineering Company

(AAE), Wilmington, Delaware. The ground equipment consisted of an AAE Model 24B unit which was comprised of a pair of rotating hydraulic energy absorbers located 100 feet apart and connected by a steel arrestor cable. One Model 24B unit was required for extraction of loads weighing up to 12 500 pounds. Two Model 24B units attached to a single arrestor cable were required for extraction of loads weighing from 12 500 to 25 000 pounds. The arrestor cable was supported approximately 4 inches above the ground by rubber disks 9 inches in diameter which were threaded onto the cable. Figure 4 shows a diagram of ground equipment.

The airborne equipment consisted of a hook assembly which was extended and retracted by a manually operated hydraulic pump. The hook assembly was normally retracted and the cargo door and ramp were closed while flying to the delivery zone. The main components of the engagement mechanism are illustrated in figure 5.

When the engagement hook contacted the ground on the approach to the arrestor cable, the entire hook assembly vibrated. A microphone located on the hook assembly mounting plate transmitted the vibration caused by ground contact to the pilot's headset so that he knew when the hook was contacting

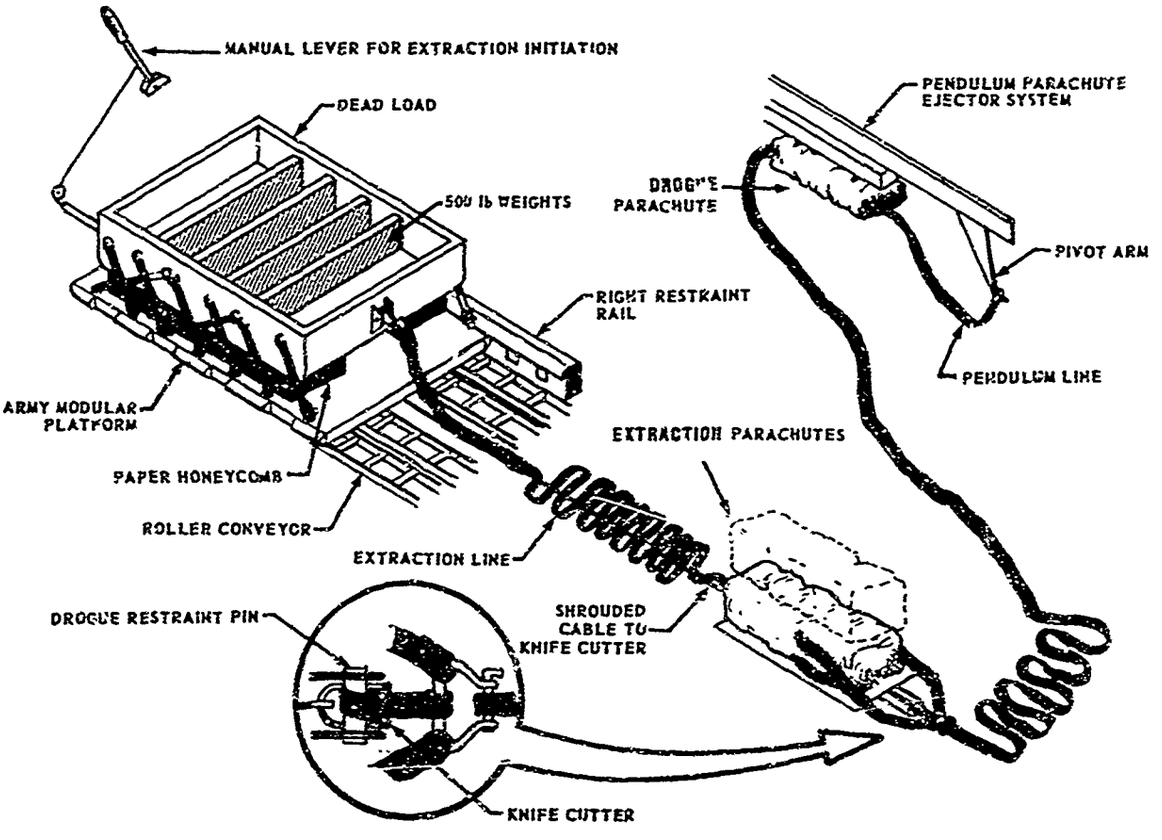


Figure 3 RING SLOT LAPES

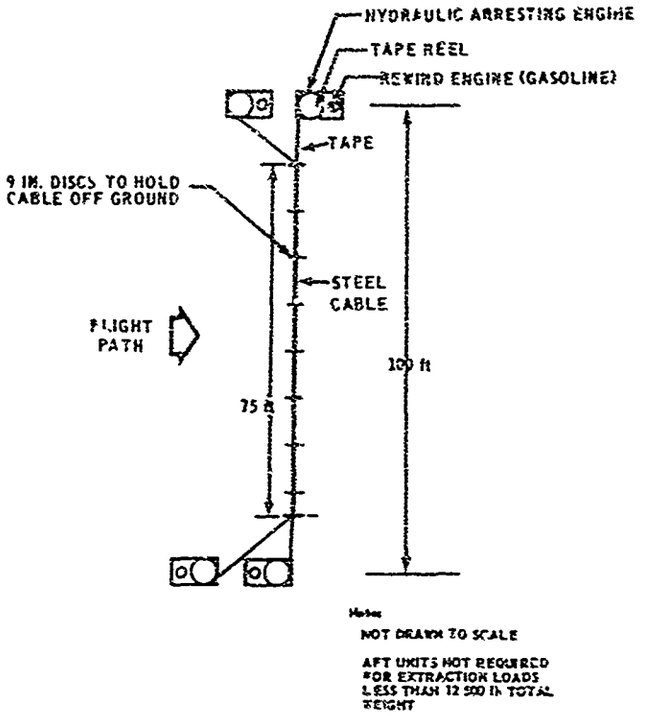


Figure 4 GPES GROUND EQUIPMENT

the ground. When the hook engaged the arrestor cable, a hook release button in the throat of the hook was depressed by the cable and the hook separated from the boom. If this hook release actuator failed, an attachment bolt sheared at a force of approximately 4000 pounds and allowed the hook to separate from the boom. When the hook was released, a 27-inch parachute deployed to prevent the hook from recoiling into the airplane in the event of a hook/cable disengagement or an arrestor cable failure. After the hook engaged the arrestor cable and the extraction line was fully extended, extraction force was applied to the load, and the right-hand latches released. The kinetic energy of the load was dissipated by the energy absorbing units.

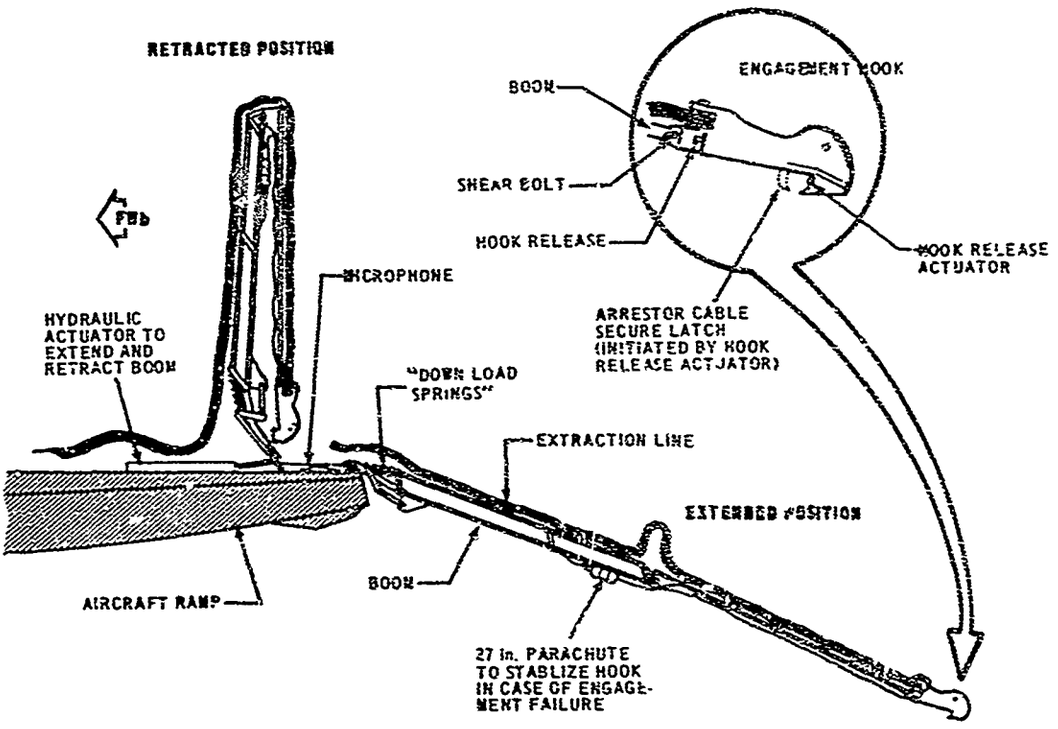


Figure 5 GPES HOOK ASSEMBLY

PHASE III RING SAIL LAPES

The RS' LAPES equipment was manufactured by the Metric Systems Corporation, Fort Walton Beach, Florida, and was being developed for operational use. A comparison between the RS' LAPES and the RS LAPES is shown in figure 6. The RS' LAPES was operated as follows:

1. The 15-foot D_O RS drogue parachute was deployed by the copilot approximately 10 seconds prior to extraction as in the RS LAPES.

2. A solenoid-operated knife cutter was activated electrically by the copilot to initiate extraction. This was done by pushing the ASSISTED TAKEOFF FIRE button. In addition, the knife cutter was manually operated by the loadmaster 1 second later to insure cutting the drogue parachute restraint line. The knife cutter cut the drogue parachute restraint line and transferred the drogue parachute force from the drogue restraint pin on the ramp to the 32-foot D_O RS' parachute(s) used to extract the load.

3. The parachute extraction force was applied through the "Vee web" to the forward portion of the platform. When the extraction force exceeded the preset restraint force of the right-hand locks, the cargo load was extracted. In contrast to the RS LAPES, the drogue parachute was physically attached to the cargo platform through the main extraction parachute. This provided approximately 5500 pounds of extraction force at 130 KIAS in the event the main parachutes malfunctioned. Approximately 3000 pounds of extraction force were provided by the drogue parachute during a normal extraction.

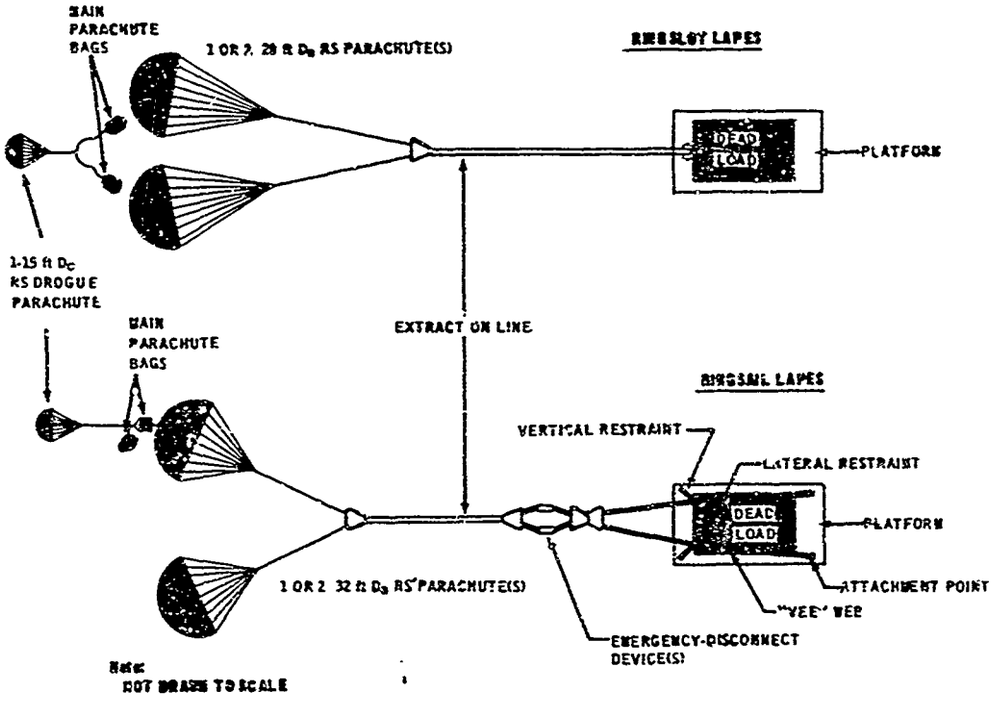


Figure 6 COMPARISON OF RING SLOT AND RING SAIL LAPES

An emergency-disconnect device was incorporated in the RS' LAPES during several of the tests. This consisted of a unit located in the extraction line just aft of the "Vee web" confluence point. If two 32-foot parachutes were used for extraction, two emergency disconnect units were placed in parallel. These units contained explosive charges which caused the extraction line to be disconnected from the extraction load when the loadmaster pressed the disconnect button. This would allow the extraction parachutes to be jettisoned in the event the locks failed to release either normally or with the emergency lock release. Additionally, this device provided a means of disconnecting the main parachutes from the load in the event of a malfunction in the device which transferred the drogue parachute force to the main parachutes. The loadmasters could then safely go aft of the load to cut the drogue parachute loose.

Test Procedures

GENERAL

All deliveries were made with the airplane in the delivery configuration: gear down, ramp and cargo door open, power for level flight and wing flaps extended either 50, 70, or 100 percent.

PHASE I RING SLOT LAPES

Final approach was established approximately 1 minute prior to extraction. At this time a stabilized trim point at 130 KIAS and a height of 50 feet was established. The drogue parachute was deployed approximately 10 seconds before extraction. A pushover and descent were made to the extraction height of 0 to 5 feet. No power changes were made from trim until after completion of the extraction test. The airspeed did not change significantly during the descent due to the additional drag of the drogue parachute. The loadmaster manually deployed the main parachute(s) upon the copilot's oral signal during the single LAPES tests. The copilot deployed the main parachute by activating a solenoid connected to the knife cutter during the sequential tests. Approaches were made to define a minimum distance required from a 50-foot height to an extraction point. No attempt was made to obtain a minimum climbout distance. Time histories of the RS LAPES extractions are presented in figures 11 through 30, appendix I. A summary of the test conditions is presented in table I, appendix I.

PHASE II GPES

The hook assembly was extended by the loadmaster approximately 3 minutes prior to extraction and final approach was established approximately 1 minute prior to extraction. The approach was flown at heights of 50 to 75 feet above the ground. The aim airspeed for extraction was either 1.15 or 1.2 times the power-off stall speed (V_S) for a given configuration, or an airspeed which resulted in a ground speed of 130 knots (the maximum design arrestor speed).[3] Figures 3 and 4, appendix I, show 1.2 V_S and maximum arrestor ground speed, respectively. High performance approaches and departures from the extraction zone were conducted to define the minimum distance required to approach from a 50-foot height, perform the extraction, and to climbout to 50- and 200-foot heights. To climbout, military rated power (MRP) was applied and the airplane was rotated to either 10, 15, or 20 degrees pitch angle as soon as the pilot was informed by the loadmaster that the load was clear

[3] Stall speed data were obtained from AFFTC TR 63-37 (reference 3).

of the aircraft. The airspeed was allowed to bleed off to maximum effort obstacle clearance speed as presented in reference 1. This speed, which was always above the airborne minimum control speed, was attained at a height of approximately 800 feet above the ground for the ambient conditions tested.

A time history of a GPES test from descent initiation to climbout is presented in figure 9, appendix I. Time histories of the extraction portion of all the GPES tests are presented in figures 31 through 61, appendix I. A summary of the test conditions is presented in table II, appendix I.

PHASE III RING SAIL LAPES

The final approach was established approximately 1 minute prior to extraction as in all the low-level deliveries. At this time the aim extraction airspeed was established at a height of approximately 100 feet. This height was used because the drogue parachute dropped 10 to 20 feet below the airplane before it blossomed. A pushover descent was then made to the extraction height of 0 to 5 feet. On some of these tests a slight power reduction and power addition were made at descent initiation and roundout, respectively, to maintain the aim airspeed during the maneuver. It was found to be easier, however, to keep the power setting constant at initiation of the descent and allow the airspeed to increase slightly. The airspeed would generally decrease to the desired aim speed at completion of the flare prior to extraction. The constant power technique was used to determine extraction zone length. The drogue parachute and the main parachute deployments were initiated by the copilot pushing the ADS CHUTE REL and the ASSISTED TAKEOFF FIRE buttons, respectively. After the load left the airplane, MRP was applied and the airplane was rotated to 20 degrees pitch angle. The airspeed was allowed to bleed off to the maximum effort obstacle clearance speed listed in reference 1.

A time history of a RS' LAPES test from descent initiation to climbout is presented in figure 10, appendix I. Time histories of the extraction portion of all the RS' LAPES tests are presented in figures 62 through 89, appendix I. A summary of the test conditions is presented in table III, appendix I.

Stability and Control Test Results

LONGITUDINAL STABILITY AND CONTROL

Normal Extractions

Normal extractions were defined as tests where the number and size of the extraction parachute(s) were calculated to provide an extraction ratio (ER)[4] greater than 1.0. The desired ER was not always achieved, however, due to the slow opening of some parachutes

No unsatisfactory stability and control characteristics were encountered during normal extraction of loads above an airspeed of 1.2 V_S by the LAPES or the GPES methods. The pilot noted only slight airplane responses while delivering loads weighing approximately 12 000 pounds or less. The airplane responses during extractions of 18 000- to 25 000-pound loads were considered mild.

[4] Extraction ratio (ER) is defined in this report as load weight divided by the average extracting force acting on the load while it is moving in the airplane.

Table II

AIRPLANE CG EXTREMES*

Extraction Number	cg Condition	cg Before Extraction (pct MAC)	cg After Extraction (pct MAC)
77	forward	22.8	15.3
46	aft	28.5	23.4
63	forward to aft shift	19.7	25.0
40	aft to forward shift	27.1	14.5

*Tables I through III, appendix I show complete test conditions.

The gross weight of the airplane without the load ranged from 93 100 to 115 500 pounds during these tests. The airplane handling characteristics while performing deliveries within this weight range were satisfactory.

The extremes of the airplane center of gravity during the tests are presented in table II.

The airplane handling characteristics while performing the tests outlined in table II were considered satisfactory. The airplane should be cleared for LAPES and GPES deliveries where the airplane cg is within the limitations shown in figure 1, appendix II, before and after extraction. (R 1)

Figure 1, appendix I, shows a summary of airplane and pilot reactions to the single extractions. Analog computer simulations indicated that the maximum normal acceleration and the pitchup experienced during an extraction was dependent on the exact time during the extraction that the elevator was deflected, the rate at which it was deflected and the magnitude of maximum elevator deflection obtained. The elevator inputs by the pilot were made in an attempt to keep the airplane close to the ground and to maintain a constant airplane attitude during the extraction. These inputs varied with airplane height and attitude after descent flare, load weight, extraction ratio, turbulence and other factors. Therefore it was difficult to predict the angle of attack, pitch angle, and normal acceleration for a particular set of test conditions.

Sequential LAPES delivery tests were performed for loads ranging from 16 000 to 28 000 pounds total load. The 28 000-pound total load consisted of a 10 000-pound aft load and an 18 000-pound forward load. These tests were performed using normal extraction forces, 130 KIAS, and an airplane mid cg. Because of the longer range of airplane center of gravity movements, more longitudinal control activity was required of the pilot during these sequential tests than during any other type of extraction performed during the test program. The stability and control characteristics of the airplane were satisfactory during these tests and a preliminary report was transmitted recommending an interim clearance to deliver these loads. Further sequential deliveries of loads up to 48 000

pounds total load have been accomplished and a preliminary report recommending clearing the airplane for sequential deliveries of loads totaling 48 000 pounds was transmitted to ASD by means of an AFFTC letter (reference 7).

Simulated Extraction System Failures

Table III summarizes tests that were conducted to simulate partial and complete failures of the extraction parachutes. The tests were performed to determine the airplane response and the pilot reaction required to counteract slow extractions caused by low ER's. Test results indicated that the pilot could use normal techniques to recover the airplane in the event of a parachute or extraction system failure.

An analog computer simulation of extraction system failures during LAPES deliveries, along with Lockheed-Georgia Company Report ER 7626 (reference 6), indicated that no airplane limits would be exceeded during extractions of up to 25 000 pound loads. The analog simulation results using an estimated pilot elevator input were obtained prior to the flight test program. These results showed more airplane reaction than an actual extraction at the same conditions. When the values of the flight test elevator input were put back into the analog simulation the results closely matched flight test data (appendix V).

The tests were conducted by first performing airdrops with successively lower ER's until approximately 0.2 ER was reached.

Table III

SIMULATED EXTRACTION SYSTEM FAILURES

Extraction Number	Type Extraction	Load Weight (lb)	Parachutes Used	Average Extraction Force (lb)	Extraction Ratio
65	airdrop	17 800	1-28 ft RS	17 800	1.00
66	airdrop	18 000	1-24 ft RS	11 100	0.62
67	airdrop	18 000	1-15 ft RS 1-32 ft RS' reefed to zero*	4 700	0.26
68	LAPES	18 000	1-15 ft RS 1-32 ft RS' reefed to zero*	6 700	0.37
69	airdrop	25 400	1-22 ft RS 1-28 ft RS	24 100	0.95
70	airdrop	24 900	1-28 ft RS	17 200	0.69
71	airdrop	25 000	1-15 ft RS 1-32 ft RS' reefed to zero*	6 100	0.24
72	LAPES	24 800	1-15 ft RS 1-32 ft RS' reefed to zero*	6 500	0.26
79	LAPES	24 700	1-15 ft RS 1-32 ft RS' reefed to zero*	6 000	0.23
80	airdrop	18 300	1-15 ft RS reefed to 148"**	1 900	0.10
81	LAPES	18 000	1-15 ft RS reefed to 148"**	1 900	0.11

* The skirt of the parachute was restrained so the parachute would not blossom.
** The circumference of the parachute at the skirt was restrained to 148 inches.

LAPES tests were then performed at 0.2 ER. An airdrop and a LAPES delivery were also performed at an ER of 0.1 for an 18 000-pound cargo weight.

The airdrops produced more airplane reaction than the LAPES deliveries for the same condition. The smaller reaction during LAPES deliveries were attributed to the "stiffening" of the airplane longitudinal stability in ground effect and to the improved horizontal reference available to the pilot while near the ground. The horizon permitted the pilot to more quickly detect airplane pitch attitude change and react to the pitch-up due to the load leaving the airplane. Figure 7 shows the maximum normal acceleration encountered during these tests. Pitch rates, both up and down, and elevator forces required to control the pitch rates were moderate and acceptable for operational situations in which a malfunction might reduce the extraction forces to those tested. Therefore, the C-130E airplane should be cleared for LAPES and GPES cargo deliveries of loads weighing up to 25 000 pounds for single loads; providing that with the worst possible single extraction system failure the extraction system used provides at least 2000 pounds of extraction force for an 18 000-pound load, and 5000 pounds for a 25 000-pound load. (R 1)

INDICATED AIR SPEED AND FLAP SETTING

Aim airspeeds used for GPES tests were 1.15 V_S, 1.2 V_S, and indicated airspeeds required for 130 knots groundspeed. The minimum airspeed at which an extraction could be made with satisfactory airplane control was 1.2 V_S. One GPES test (number 28) figure 38, appendix I, was performed at 109 800 pounds using a 50-percent flap setting and an airspeed of 1.15 V_S. The extraction airspeed was 105 KIAS, 1 knot below the 106 KIAS minimum threshold speed recommended in reference 1. The minimum recommended threshold speed was placed in the Flight Manual because of the negative dihedral characteristics exhibited at slow speeds in

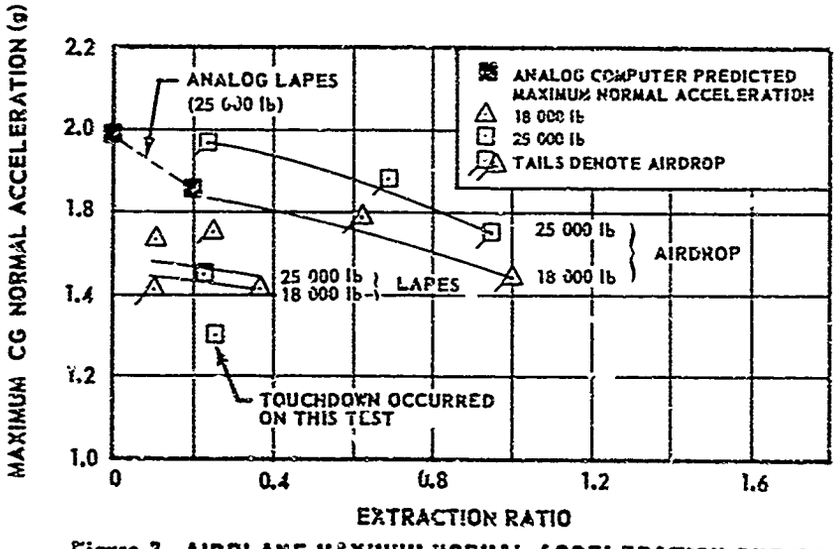


Figure 7 AIRPLANE MAXIMUM NORMAL ACCELERATION DUE TO SIMULATED EXTRACTION SYSTEM FAILURES

the landing configuration. Airplane response to lateral control was slow, and continuous aileron control wheel movement was required to maintain a wings-level attitude during light turbulence. Lateral-directional activity during this extraction is shown in figure 39, appendix I. The airplane pitch attitude during the approach, as noted on the pilot's attitude indicator, was approximately 10 degrees noseup. At this pitch attitude the cargo ramp would contact the ground prior to the main landing gear; therefore, a shallow approach had to be used to avoid ramp touchdown. The airplane handling characteristics during the extraction at 1.15 V_S were unsatisfactory.

GPES test (number 29) figure 40, appendix I, was performed at 100 200 pounds gross weight using a 100-percent flap setting and a 1.2 V_S extraction airspeed. This test was conducted in approximately the same atmospheric turbulence conditions as was the preceding test. Even though the 95 KIAS extraction speed was 11 knots below the Flight Manual minimum recommended threshold speed of 106 KIAS, the aircraft control response was improved and considered satisfactory. These tests indicated 1.2 V_S could be used as a minimum extraction speed even though the speed was less than 106 KIAS. Aircraft control response decreased below 106 KIAS but was satisfactory if a minimum airspeed of 1.2 V_S was maintained.

The indicated airspeed that corresponds with 130 knots groundspeed should be used for GPES deliveries since this higher speed results in improved airplane handling characteristics. If wind conditions are such that the arrestor gear will be approached at less than 1.2 V_S in order to remain below the GPES equipment 130 knots groundspeed limitation, the extraction should be conducted on a reciprocal heading, terrain permitting, to take advantage of the headwind. (R 2)

Aim airspeeds used for the single LAPES tests were 1.2 V_S, 130 KIAS and 140 KIAS. Airplane handling characteristics for all single extractions, GPES and LAPES, performed at airspeeds of 1.2 V_S and higher were considered satisfactory. The higher airspeeds, 130 and 140 KIAS, gave the pilot more roundout capability while transitioning from the descent to the extraction height. These higher speeds also reduced the climbout distance as the airspeed above the maximum effort obstacle clearance speed could be converted to altitude during the initial phase of climbout. Not enough testing was performed at 140 KIAS to determine the effects of this higher speed on parachute reliability and extraction load survivability; therefore, speeds above 130 KIAS cannot be recommended. An airspeed of 130 KIAS should be used for LAPES extractions where zone distance is critical and a performance descent and climbout have to be made. (R 3)

Wing flap settings used for the GPES tests were 50, 70, and 100 percent. Settings of 50 and 70 percent were used for the LAPES tests. All flap settings used above 1.2 V_S resulted in satisfactory airplane handling characteristics.

Any airplane pitch attitude at trim between 0 and 5 degrees was considered satisfactory for delivery when a shallow approach to the extraction zone could be made. Pitch attitudes at trim of less than 0 or greater than 5 degrees could be tolerated if a touchdown during extraction could be positively avoided. Touchdown could be fairly easily avoided by using a shallow approach. A pitch attitude at trim as near 0 degrees

as possible was preferred if a steep approach (where touchdown was more likely to occur) was required to enter the extraction zone. This attitude could be obtained by varying the flap setting while monitoring the pilot's attitude indicator. The relative position of the arrow on the attitude indicator pitch trim knob and the index was noted with the horizon bar alined with the miniature airplane prior to takeoff with the airplane in a level attitude. This same relative position between the pitch trim knob and the index was then established with the airplane in level flight at the aim indicated airspeed prior to the extraction. The pitch attitude of the airplane was then adjusted to approximately level by use of wing flaps. (R 4)

EFFECT OF TOUCHDOWN ON EXTRACTION

Steep approaches were made to define the minimum distance required to approach over an obstacle, deliver the cargo, and to climb out over an obstacle. Many of these approaches resulted in light to firm touchdown just prior to or at extraction. The airplane contacted the ground firmly on one LAPES delivery (figure 63, appendix I) with a 6.5-degree pitch attitude. The main gear struts compressed enough to allow the ramp to contact the ground, causing minor damage to the underside of the ramp.

The airplane pitch angle during the flare must be carefully monitored by the pilot, particularly if attempting a steep approach over an obstacle, as touchdown is likely to occur under these conditions; however, allowing the airplane to contact the ground with a slight noseup attitude was preferable to avoiding touchdown with an exaggerated roundout and a resulting high pitch angle.

On several of the LAPES tests, the main landing gear wheels were rolling on the ground during extraction. This slightly reduced the airplane reaction to the extraction, but intentional touchdown on unimproved surfaces cannot be recommended because of possible damage to the tires or bottom of the airplane. (R 5)

The airplane rolled across the arrestor cable on several occasions during GPES deliveries, causing the cable to bounce. The bouncing cable evidently did not contact the underside of the airplane as no damage was observed. Again the airplane response to the extraction was damped; however, due to possible airplane or cable damage, an intentional touchdown is not recommended on GPES deliveries. (R 5)

TURBULENCE AND CROSSWIND [5]

Atmospheric conditions ranged from calm to moderately turbulent during the testing. Other than requiring more control activity, particularly lateral control at the slower speeds tested, moderate turbulence presented no problems during any type extraction.

Maximum crosswinds encountered during any of the extractions were 6 knots from the left and 7 knots from the right. These crosswinds produced no handling problems. The drift was corrected by crabbing the airplane while maintaining a wings level attitude.

OFFCENTER cg LOADS

The cg's of loads were deliberately rigged offcenter laterally on both LAPES and GPES tests as shown in table IV. No aircraft response other than that which

[5] In this report, light turbulence is defined by 2 to 4 KIAS fluctuation and moderate turbulence by 5 to 8 KIAS fluctuation on the pilot's airspeed indicator.

Table IV

OFFCENTER CG LOAD TESTS

Type of Delivery	Load Weight (lb)	Lateral Displacement of Load cg from Platform Centerline (in.)
GPES	11 900	8 left
GPES	11 900	8 right
GPES	11 900	8 right
GPES	25 100	2 right
LAPES	13 000	6 right
LAPES	24 800	10 right

would be attributed to turbulence was noticed on the lateral-directional parameter traces during these extractions. The pilot did not notice any lateral-directional disturbances. Time histories of the lateral-directional parameters for three of these tests are presented in figures 49, 51 and 53, appendix I.

■ OFFCENTER GPES ENGAGEMENTS

On several GPES tests, engagements were intentionally made up to 30 feet from the center of the arrestor cable, 7.5 feet from where the engine tape was connected to the cable. Neither the aircraft nor the load was noticeably affected by the offcenter engagements

Performance Test Results

■ EXTRACTION ZONE LENGTH DETERMINATION

The descent and climbout data as obtained by phototheodolites were corrected to sea level standard day conditions and are presented in figures 5 and 6, appendix I. These data, along with the distances required to extract the loads, were used to produce the extraction zone lengths shown in figure 8.

The descent technique employed during the GPES deliveries was to push over from a height of 50 feet at a distance from the extraction point so that the GPES hook would contact the ground 50 to 100 feet prior to engaging the arrestor cable. Power for level flight at trim was maintained throughout the descent and extraction. Some airspeed, usually 2 or 3 KIAS, was gained during the descent.

Approaches were made from a height of 100 feet on the Phase III (RS' LAPES) tests because the drogue parachute when initially deployed dropped well below the airplane (10 to 20 feet). Therefore, approaching at a height of 100 feet above the terrain would be required for assuring adequate clearance of a 70-foot obstacle. Power for level flight was maintained during the descent and extraction when determining extraction zone lengths. The slight increase in airspeed during the descent was dissipated during the flare prior to extraction. The extraction sequence was initiated by the copilot as the nose of the airplane passed over the extraction point.

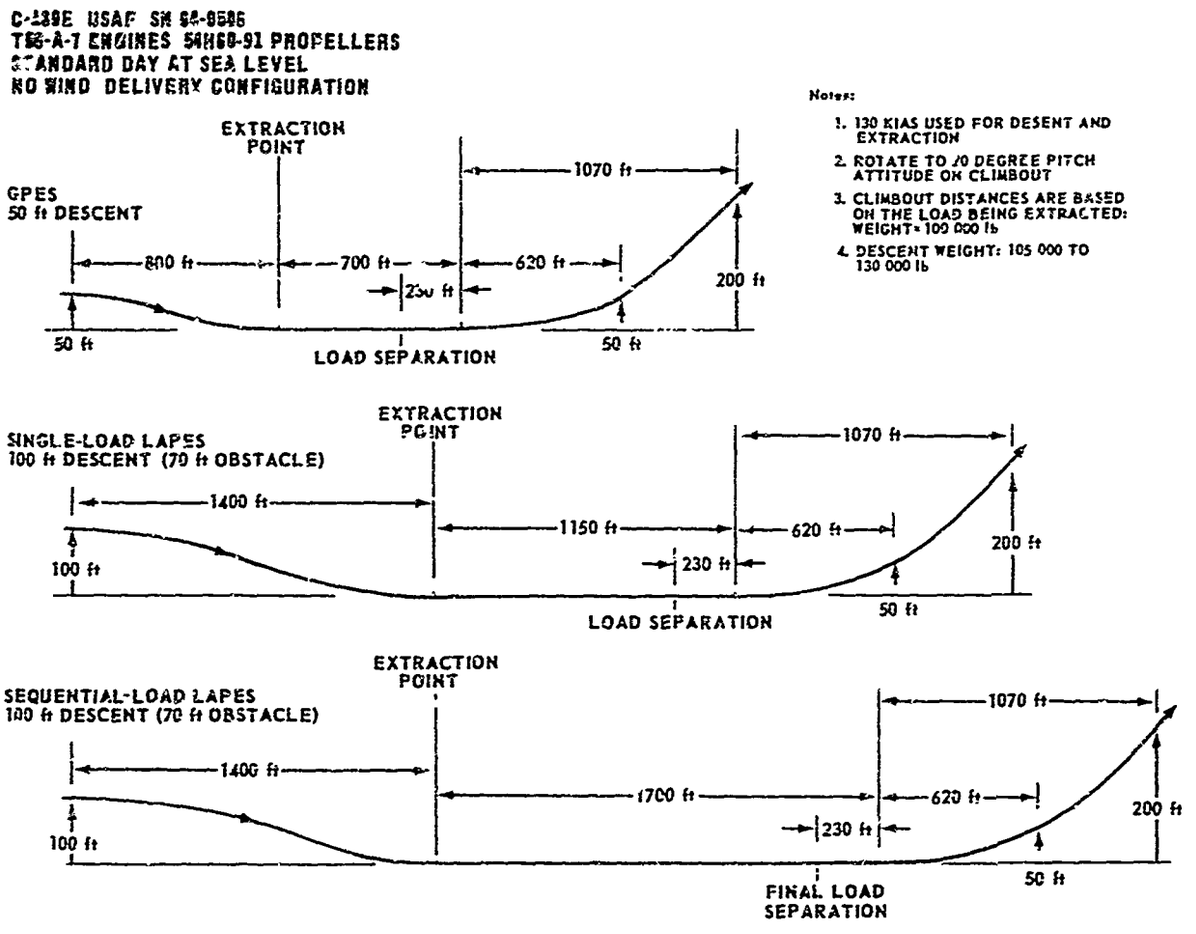


Figure 8 EXTRACTION ZONE DISTANCE REQUIRED

Distances from extraction initiation to start climbout for GPES and LAPES deliveries were determined from the longest extraction times experienced during these tests. These distances were computed for 130 KIAS. The longest GPES extraction time experienced was 2 seconds from hook engagement to load separation. The longest LAPES time was 4 seconds from copilot initiation to load separation. Tests where the force transfer failed to take place upon the copilot's signal and had to be accomplished manually by the loadmaster were not considered in determining this longest LAPES time. The longest sequential LAPES time was 6.4 seconds from extraction initiation to final load separation. One second was added to these times to provide time for the loadmaster to advise the pilot that the load had been extracted. The pilot did not initiate climbout until he was advised that the load had cleared the airplane.

To climb from the extraction zone, the pilot advanced the throttles to MRP and rotated the airplane to either 10, 15, or 20 degrees pitch angle. These tests indicated that rotating to an angle of 20 degrees on the pilot's attitude indicator resulted in good initial climbout performance.

Forward visibility was adequate at this attitude. The airspeed was then allowed to bleed off to the maximum effort obstacle clearance speed listed in the Flight Manual. This speed was attained between 500 and 1000 feet above the terrain. To provide a safety margin in the event of an extraction failure, the maximum effort obstacle clearance speed should be based on the gross weight of the airplane with the load on board. This speed should be compared with the minimum control speed and the higher of the two speeds used for the final phase of the climbout. (R 6)

The total extraction zone distances of 2120 feet (50 foot height to 50 foot height) for GPES and 3170 feet (100 foot height on descent and 50 foot height on climbout) for single load LAPES represent normal extractions only. They do not account for the cases in which the drogue parachute had to be towed from the extraction zone or in which an extraction parachute failed. Extraction zone distance charts should be placed in the C-130E Flight Manual. These charts should be based on the above distances with the exception of the climbout phase, which should be based on the gross weight of the airplane with the cargo load still on board. The climbout distance should also be based on towing the drogue parachute if it is not practical to install an emergency release device to jettison the drogue parachute. (R 7, R 8)

CLIMBOUT PERFORMANCE WITH THE DROGUE PARACHUTE ATTACHED

On several occasions during the LAPES testing, malfunctions occurred which required climbing from the extraction zone with the load still in the airplane and the 15-foot D_o RS drogue parachute being towed. There was no provision to jettison the drogue parachute during these tests. The drogue seriously reduced the climb performance of the airplane in the delivery configuration.

Tests were conducted at MRP to determine the climb capability in the delivery configuration at 130 000 pounds gross weight with 70 percent flaps and towing a 15-foot D_o RS drogue parachute. At 121 KCAS the drag force of the drogue parachute was approximately 5500 pounds. At 121 KCAS and 2000 feet pressure altitude on a standard day the approximate increase in rate of climb for a 130 000-pound airplane if the drogue parachute could be jettisoned would be 540 feet per minute (from 880 feet per minute to 1420 feet per minute). At 140 KIAS, the drag force increased to approximately 7000 pounds which corresponded to 790 feet per minute less rate of climb than would be available if the drogue parachute were not attached (figure 9). The results of the sawtooth climb test are presented in figure 8, appendix I.

Since climb performance may be critical in the event of an extraction failure, a drogue parachute jettison device should be installed in the extraction system. The device would provide a means to jettison the drogue parachute in the event of a malfunction which would prevent drogue parachute force transfer. An additional drogue parachute should be carried in the airplane so that another extraction could be attempted in the event the malfunction can be corrected in flight. If it is not practical to install a jettison device for the drogue parachute, the climbout data in reference 1 must be based on performance while towing a drogue parachute from the extraction zone. (R 8)

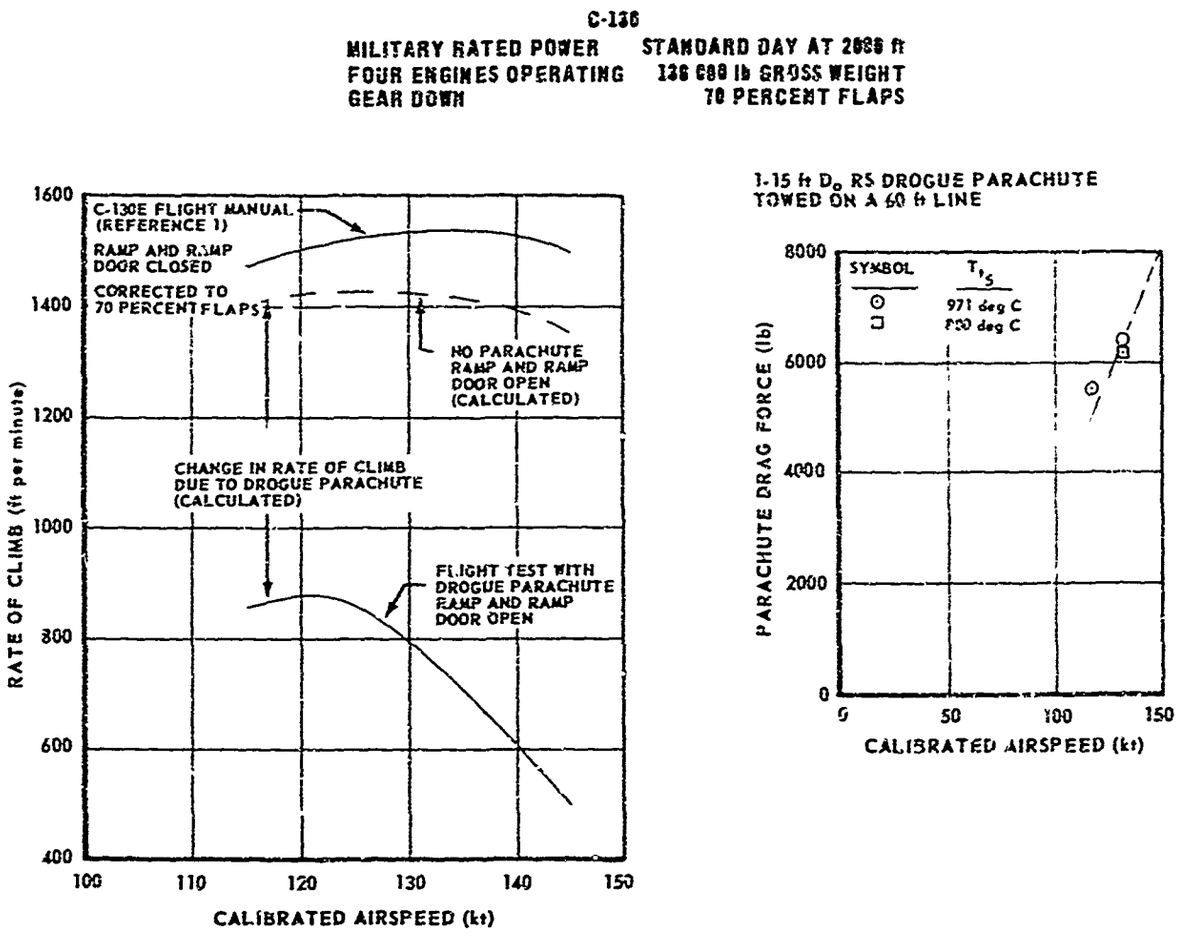


Figure 9 CLIMB CAPABILITY WITH AND WITHOUT DROGUE PARACHUTE DRAG

ENGINE PERFORMANCE

Engine performance data were obtained at 15 000 feet pressure altitude during level flight and during the sawtooth climb tests at 2000 feet pressure altitude. The shaft horsepower-turbine inlet temperature (shp-TIT) relationship was obtained to compare the T56-A-7 engines on the test airplane to those used during the reference 3 tests which were the data basis for reference 1. The level flight data points showed the average of the four engines on the test airplane produced approximately 6.7 percent more shp at MRP (971 degrees C TIT) than did the engines used in the C-130E Category II tests (figure 7, appendix I).

AIRSPEED CALIBRATION

Airspeed calibration data in ground effect were obtained during these tests. These data are presented in figure 2, appendix I. The 1- to 4-knot difference between the data obtained on the LAPES and GPES tests and the data obtained during the reference 3 tests at landing touchdown was attributed to the difference in power settings. Power for level flight was used for the LAPES and

GPES tests while flight idle power was used for the reference 3 landing tests. The airspeed calibration obtained during these tests is also reflected in figure 4, appendix I, which should be used to determine the indicated airspeed corresponding to 130 knots groundspeed for GPES extractions. The airspeed calibration obtained during the LAPES and GPES tests should be used to determine maximum allowable indicated airspeed for GPES deliveries. (P 9)

Dual Rail System Test Results

Dual rail system tests were conducted in conjunction with airplane stability and control tests during LAPES and GPES deliveries. The objectives of the tests were to evaluate and determine the suitability of the DRCHS for LAPES and GPES deliveries and to determine the adequacy of the variable-restraint lock settings listed in table 4B-2, reference 2 for LAPES and GPES deliveries.

A functional evaluation of the A/A32H-4 DRCHS had been conducted by the 6511th Test Group (Parachute) at the Naval Air Facility, El Centro, California, in 1963 and presented in FTC-TR-63-46 (reference 8). Aerial delivery tests at that time consisted of airdrops from altitudes of 1500 to 5000 feet. Further work with the A/A32H-4 DRCHS was done by the Tactical Air Command and the 6511th Test Group (Parachute) in developing delivery techniques for LAPES and GPES delivery missions. The tests presented in this report were conducted prior to clearance of the system for operational LAPES and GPES delivery missions.

SPECIFIC SYSTEM TESTS

Variable-Restraint Locks

Variable-restraint lock data were obtained during LAPES and GPES deliveries to determine latch release force versus lock setting, total restraint versus total restraint set, latch loads prior to extraction, and latch "snapback" during extraction.

Latch load and release force data were obtained from strain gages mounted on the lock body at the cam-roller pivot ear (figure 3, appendix II). Latch movement and position was obtained from a rotary potentiometer connected to the latch cam assembly and mounted on the back of the conveyor rail (figure 4, appendix II). The lock assemblies were disassembled and instrumented, then reassembled and calibrated with the Brooks and Perkins, Inc., lock calibrator, part number 1017-200. The calibration procedures supplied by the contractor were used and found inadequate. Detailed comments and recommended procedures are contained in appendix III. Lock data were recorded on the rail system oscillograph installed in the airplane cargo compartment (figure 5, appendix II). (R 18)

No special test method was used to determine lock performance. Normal operating and load rigging procedures, as outlined in reference 2, section IV, were used for platform loading, rigging, and airdrops.

For Phase I tests, RS LAPES, the locks were set according to table 4B-2, section IVB, with the exception that the settings used for these extractions were for a load weight equal to twice the actual load weight being extracted. For example, lock settings listed for a 16 000-pound load were used when an 8000-pound load was to be

extracted. This would supposedly provide an aft restraining force equivalent to the platform gross weight (restraint-to-weight ratio of 1.0) since table 4B-2 was intended to provide an aft restraining force equal to one-half the platform gross weight being extracted (restraint-to-weight ratio of 0.5). This deviation from the procedures outlined in reference 2 was requested by the 6511th Test Group (Parachute) based on their experience during cargo airdrop testing. Their tests indicated that the listed lock settings did not necessarily prevent premature platform release during low level airdrops. The Systems Engineering Group representative at the test site concurred with the deviation. Table V lists the total restraint settings recommended by the T.O. and the actual total restraint settings used for these tests.

During Phase II tests, GPES, the lock settings were varied to determine the best total restraint-to-weight ratio necessary to provide adequate platform restraint and to prevent premature platform release in the event of aircraft contact with the ground prior to hook/cable engagement, or to prevent inadvertent platform release in the event of a missed engagement. For extraction numbers 21 through 37, the number of variable-restraint locks recommended in reference 2, table 4B-2, was used. On eight of these tests, lock settings given in the T.O. were used. Nine of the tests were conducted with lock settings given for 1.25, 1.50, 1.75, and 2.0 times the actual weight of the load to be extracted. For extraction numbers 38 through 47, all engaged locks were set equally to provide a total aft restraint-to-weight ratio of approximately 0.5. Total restraint settings recommended by the T.O. and total restraint settings actually used for each Phase II test are listed in table V.

For Phase III tests, RS' LAPES, the load platforms were rigged according to instructions of representatives from Metric Systems Corporation, manufacturers of the RS' LAPES equipment. Lock settings were varied in an effort to determine the best restraint-to-weight ratio that would prevent premature platform release. For the first six RS' LAPES extractions, the number of restraint locks recommended in table 4B-2 were set, but lock settings were used as listed for weights of 1.0, 1.5, and 2.0 times the actual load weight to be extracted. For the remaining tests, all variable-restraint locks engaged with the platform were set with an equal scale setting, to provide a total restraint-to-weight ratio ranging from approximately 0.5 to 1.0. This procedure was followed to determine the best ratio that would prevent premature or inadvertent platform release, and to determine if platform release at initial extraction force could be prevented by the higher restraint ratios without any effect on the extraction force required or on the airplane performance during the extraction. The total restraint recommended by reference 2 and the total restraint actually set for each test in Phase III is listed in table V.

Individual lock release force data obtained throughout the test program indicated that the method of platform extraction did not affect the force necessary to cause latch release. Measured force at latch release for each lock was usually within 200 pounds of the indicated release force setting preloaded into the lock assembly by use of the adjusting bolt and the index scale. Three major factors could cause variation within this range:

1. Parallax between the preload scale increment marks and the spring-index mark.

TABLE V

EXTRACTION DATA SUMMAR

C-130E USAF S/N 64-0560 WITH A/A 32H-4 DUAL R

GENERAL DATA			PLATFORM DATA				CHUTE DATA					R
EXTRACTION NUMBER	AIRSPEED (KIAS)	ALTITUDE (ft abs)	WEIGHT (lb)	LENGTH (ft)	* TYPE	PLATFORM[1] CONDITION AFTER EXTRACTION	No. USED	** TYPE	DIAMETER (ft)	No. OF LOCKS SET	*** TOTAL T.O.[2] RESTRAINT SETTING (lb)	TOTAL[2] RESTRAINT SET (lb)
1	132	4	8 240	8	1	D	1	RS	28	2	2500	4 760
2	125	1	11 500	12	1	S	1	RS	28	3	3760	7 000
3	125	1	12 180	12	2	D	2	RS	28	3	3760	7 000
4	132	2	16 060	16	1	S	1	RS	28	4	4760	9 000
5	128	3	15 780	16	2	D	2	RS	28	4	4750	9 000
6	125	3	18 100	16	1	D	2	RS	28	3	5240	9 750
7	134	6	18 100	16	1	D	2	RS	28	4	5240	9 750
8 Aft	121	1.5	8 100	8	3	O	1	RS	28	3	2380	4 500
8 Fwd	120.5	2.5	7 900	8	2	S	1	RS	28	3	2380	4 500
9												
10 Aft	125	1	8 000	8	2	S	1	RS	28	3	2380	4 500
10 Fwd	125	1	16 000	16	2	S	1	RS	28	4	4760	9 000
11 Aft	131.5	6	8 000	8	2	D	1	RS	28	3	2380	4 500
11 Fwd	131	8	15 900	16	1	D	1	RS	28	4	4760	9 000
12 Aft	128	4	8 000	8	1	D	1	RS	28	3	2380	4 500
12 Fwd	135	5	15 900	16	1	D	2	RS	28	4	4760	8 500
13 Aft	133.5	4	8 200	8	2	D	1	RS	28	3	2380	4 500
13 Fwd	133	1.5	15 900	16	2	S	2	RS	28	4	4760	8 500
14 Aft	128	5.5	10 200	12	2	S	1	RS	28	3	3000	5 500
14 Fwd	128.5	6.5	16 000	16	1	D	1	RS	28	4	4760	8 500
15 Aft	123	1	10 000	12	1	O	1	RS	28	4	2750	5 500
15 Fwd	127	1.5	16 100	16	2	S	1	RS	28	4	4760	8 500
16 Aft	125.5	1	10 000	12	1	S	1	RS	28	4	2750	5 500
16 Fwd	129	1.5	16 100	16	2	S	2	RS	28	4	4760	8 500
17 Aft	130	0	10 400	12	2	S	1	RS	28	4	2750	5 500

[1] O – No platform damage – reusable
S – Platform damaged but intact – not reusable
D – Platform completly destroyed

[2] Assumes no restraint from locks set at 0.25

* 1 – Army Modular Platform
2 – Interim Platform
3 – Metric Platform

* RS – Ring Slot Parachute
RS – Ring Sail Parachute
(R) – Parachute Started Reefed

** T.O. – T.O. 1C-130A-9 Table 4B-2

TABLE V

ION DATA SUMMARY TABLE

A/A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM

R	EXTRACTION DATA						REMARKS
	No. OF LOCKS SET	TOTAL T.O.[2] RESTRAINT SETTING (lb)	TOTAL[2] RESTRAINT SET (lb)	TOTAL[2] RESTRAINT MEASURED (lb)	MEASURED RESTRAINT TO WEIGHT RATIO	EXTRACTION FORCE AT LOCK RELEASE (lb)	PEAK EXTRACTION FORCE (lb)	
	2	2500	4 760	4 710	0.58	8 750	20 000	
	3	3760	7 000	6 800	0.58	10 000	15 300	
	3	3760	7 000	3 500	0.27	10 000	21 000	One latch did not engage.
	4	4760	9 000	8 940	0.43	NO DATA	NO DATA	Extraction load pickup connector failed.
	4	4760	9 000	9 270	0.58	26 500	27 500	
	3	5240	9 750	9 300	0.52	15 100	20 800	
	4	5240	9 750	10 000	0.55	24 000	NO DATA	Extraction load pickup connector separated after lock release.
	3	2380	4 500	4 200	0.52	8 700	14 500	
	3	2380	4 500	4 570	0.58	8 700	16 300	
						NO DATA	NO DATA	Oscilloscope circuit malfunctioned. No data.
	3	2380	4 500	4 240	0.53	7 500	17 000	
	4	4760	9 000	8 700	0.54	15 500	20 500	
	2	2380	4 500	4 320	0.54	10 000	15 000	
	4	4760	9 000	8 720	0.54	14 000	21 000	
	3	2380	4 500	4 320	0.54	13 000	20 000	
	4	4760	8 500	8 370	0.53	14 000	30 100	
	3	2380	4 500	4 000	0.49	8 700	19 000	
	4	4760	8 500	7 900	0.50	14 000	27 000	
	3	3000	5 500	5 870	0.58	10 000	20 500	
	4	4760	8 500	8 860	0.55	12 200	18 800	
	4	2750	5 500	5 320	0.53	9 800	19 800	#8 latch did not remain fully retracted. Lock set at 0.25.
	4	4760	8 500	8 160	0.51	14 700	17 300	
	4	2750	5 500	5 400	0.54	8 000	17 000	#8 latch did not remain fully retracted. Lock set at 0.25.
	4	4760	8 500	8 850	0.55	14 000	28 700	
	4	2750	5 500	5 370	0.54	14 000	21 800	#8 & #12 latches did not remain fully retracted. Locks set at 0.25.

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TABLE V continued

GENERAL DATA			PLATFORM DATA				CHUTE DATA			EXTRA			
EXTRACTION NUMBER	AIRSPEED (KIAS)	ALTITUDE (ft abs)	WEIGHT (lb)	LENGTH (ft)	TYPE	PLATFORM[1] CONDITION AFTER EXTRACTION	No USED	TYPE	DIAMETER (ft)	No OF LOCKS SET	TOTAL T.O.[***] RESTRAINT SETTING (lb)	TOTAL[2] RESTRAINT SET (lb)	TO RES MEA
17 Fwd	134	0	16 300	16	2	S	2	RS	28	4	4760	8 500	8
18 Aft	134	5	10 200	12	2	S	1	RS	28	4	2750	5 500	5
18 Fwd	138.5	5.5	18 200	16	2	S	2	RS	28	4	5240	9 000	9
19 Aft	131.5	3	10 200	12	2	S	1	RS	28	4	2750	5 500	5
19 Fwd	139.5	5	18 000	16	2	S	2	RS	28	4	5240	9 000	8
20 Aft	129.5	4.5	10 200	12	1	D	1	RS	28	4	2750	5 500	5
20 Fwd	130	5	18 100	16	2	S	2	RS	28	4	5240	9 000	8
21	119	3	12 200	12	2	O				4	3760	3 760	3
22	118.5	2	6 250	8	1	D				2	1880	1 880	1
23	118	3.5	18 400	16	2	S				4	5240	4 760	4
24	118.5	1	25 000	20	1	O				6	7000	7 000	6
25	121.5	2	6 200	8	1	D				3	1880	3 760	3
26	111.5	1	6 200	8	1	D				2	1880	3 760	3
27	117	3	6 200	8	1	D				2	1880	3 760	3
28	106	5	6 200	8	1	D				3	1880	1 880	1
29	94	3	6 200	8	1	O				3	1880	1 880	1
30	121	2	25 100	20	1	O				7	7000	7 000	7
31	117.5	2	12 000	12	1	D				3	3760	3 760	4
32	118	1	12 000	12	1	O				4	3500	4 760	5
33	109	1	12 000	12	1	S				3	3760	5 240	5
34	126.5	0	18 100	16	1	O				5	5240	6 500	6

1 O – No platform damage – reusable
S – Platform damaged but intact – not reusable.
D – Platform completely destroyed

∠ Assu… no restraint from locks set at 0.25 .
* 1 – Army Modular Platform
2 – Interim Platform
3 – Metric Platform

** RS – Ring Slot Parachute
RS' – Ring Sail Parachute
(R) – Parachute Skirt Revised
*** T.O. – T.O. 1C–130A–9, Table 4b-2

TABLE V continued

DATA	EXTRACTION DATA							
DIAMETER (ft)	No. OF LOCKS SET	TOTAL T O[2] RESTRAINT SETTING (lb)	TOTAL[2] RESTRAINT SET (lb)	TOTAL[2] RESTRAINT MEASURED (lb)	MEASURED RESTRAINT TO WEIGHT RATIO	EXTRACTION FORCE AT LOCK RELEASE (lb)	PEAK EXTRACTION FORCE (lb)	REMARKS
28	4	4760	8 500	8 430	0.53	16 500	29 500	
28	4	2750	5 500	5 620	0.56	12 000	21 800	#8 lock set at 0.50 - latch remained retracted. #11 lock set at 0.25. Latch did not remain fully retracted.
28	4	5240	9 000	9 180	0.51	19 800	34 000	#7 latch did not fully retract. Lock set at 0.25.
28	4	2750	5 500	5 370	0.53	17 000	21 000	#8 & #11 locks set at 0.50. Both latches remained retracted.
28	4	5240	9 000	8 510	0.48	21 300	29 500	
28	4	2750	5 500	5 540	0.54	8 800	18 700	
28	4	5240	9 000	8 740	0.48	17 400	29 700	
	4	3760	3 760	3 780	0.31	17 000	27 500	#8 latch did not retract fully. Lock set at 0.25.
	2	1880	1 880	1 820	0.29	21 000	NO DATA	Extraction force estimated. Lost trace prior to lock release. Hook engaged 10' offcenter.
	4	5240	4 760	4 470	0.24	30 200	35 500	Hook struck rock and released early on first pass. Second pass successful.
	6	7000	7 000	6 750	0.27	30 200	59 000	Hook missed cable on first pass. Second pass successful.
	3	1880	3 760	3 650	0.59	21 200	30 000	
	2	1880	3 760	3 750	0.60	15 000	22 300	Airplane touched down prior to extraction. High lock loads observed.
	2	1880	3 760	3 840	0.62	NO DATA	NO DATA	Lost extraction force trace - Hook engaged 22' offcenter.
	3	1880	1 880	1 900	0.31	13 500	24 000	
	3	1880	1 880	1 920	0.32	NO DATA	NO DATA	Lost extraction force trace. #6 & #9 latches did not retract fully. Locks set at 0.25.
	7	7000	7 000	7 720	0.30	30 000	67 500	
	3	3760	3 760	4 200	0.35	20 200	30 500	Hook engaged cable 17' offcenter.
	4	3500	4 760	5 200	0.43	22 000	27 000	Hook engaged cable 13' offcenter.
	3	3760	5 240	5 300	0.44	24 500	24 500	
	5	5240	6 500	6 670	0.37	37 000	55 500	Airplane touched down prior to extraction. High lock loads.

e Parachute
i Parachute
e Skirt Reefed
TC-130A-9, Table 48-2

TABLE V continued

GENERAL DATA			PLATFORM DATA				CHUTE DATA			EXTRAC			
EXTRACTION NUMBER	AIRSPEED (KIAS)	ALTITUDE (ft abs)	WEIGHT (lb)	LENGTH (ft)	* TYPE	PLATFORM CONDITION AFTER EXTRACTION [1]	No. USED	** TYPE	DIAMETER (ft)	No. OF LOCKS SET	*** TOTAL T O. RESTRAINT SETTING (lb) [2]	TOTAL RESTRAINT SET (lb) [2]	TOTAL RESTRAI MEASURE (lb)
35	113	1	12 100	12	1	O				4	3760	6 000	5 38
36	123	2	18 100	16	1	O				5	5240	7 500	8 10
37	114	1	12 000	16	1	O				5	3500	7 000	7 24
38	120	0	11 950	16	1	O				4	3500	6 000	6 69
39	117	5	11 950	16	1	S				4	3500	6 000	6 32
40	118.5	1	24 900	20	1	S				5	7000	12 500	13 38
41	122	2.5	24 900	20	1	S				6	7000	12 000	12 58
42	109.5	0	25 100	20	1	S				6	7000	12 000	12 390
43	111.5	1	24 900	20	1	D				6	7000	12 000	12 400
44	120.5	2	18 250	16	1	O				4	5240	7 000	7 340
45	124	3	18 150	16	1	S				4	5240	9 000	9 450
46	123	0	24 900	20	1	D				6	7000	12 000	12 490
47	126	1	24 850	20	1	D				5	7000	12 500	12 680
48	130	2	12 300	12	1	D	1	RS'	32	3	3760	7 000	7 300
49	137	5	12 100	12	1	D	1	RS'	32	3	3760	3 760	4 020
50	131	1	12 400	12	2	S	1	RS'	32	3	3760	5 240	5 290
56	127	5	18 200	16	2	S	1	RS'	32	5	5240	7 000	7 140
57	131	5	18 600	16	2	D	1	RS'	32	5	5240	7 500	7 520
58	125	4	18 400	16	2	S	1	RS'	32	4	5240	5 240	5 350

[1] O – No platform damage – reusable
S – Platform damaged but intact – not reusable
D – Platform completly destroyed

[2] Assumes no restraint from locks set at 0 25

* 1 – Army Modular Platform
2 – Interim Platform
3 – Metric Platform

** RS – Ring Slot Parachute
RS – Ring Sail Parachute
(R) – Parachute Skirted Reefed

*** T O – T O 1C– 130A–9 Table 4b-2

TABLE V continued

ETER (ft)	EXTRACTION DATA							REMARKS
	No. OF LOCKS SET	TOTAL T.O.[2] RESTRAINT SETTING (lb)	TOTAL[2] RESTRAINT SET (lb)	TOTAL[2] RESTRAINT MEASURED (lb)	MEASURED RESTRAINT TO WEIGHT RATIO	EXTRACTION FORCE AT LOCK RELEASE (lb)	PEAK EXTRACTION FORCE (lb)	
	4	3760	6 000	5 380	0.49	10 000	29 500	
	5	5240	7 500	8 100	0.45	32 000	48 000	Hook engaged cable 15' offcenter.
	5	3500	7 000	7 240	0.60	27 500	51 500	Airplane touched down prior to extraction - high lock loads. Used tandem ground arresters.
	4	3500	6 000	6 690	0.56	22 300	41 500	Asymmetric load. Used tandem ground arresters.
	4	3500	6 000	6 320	0.53	15 500	42 500	Asymmetric load. Used tandem ground arresters.
	5	7000	12 500	13 380	0.54	23 000	53 500	3 passes made before successful engagement. Airplane touched down on all passes. High lock loads measured at touchdown.
	6	7000	12 000	12 580	0.51	18 700	61 000	
	6	7000	12 000	12 390	0.49	15 600	32 500	Asymmetric load. Airplane touched down prior to extraction. High lock loads.
	6	7000	12 000	12 400	0.50	19 000	37 000	Airplane touchdown. High lock loads before extraction. Engaged 20' offcenter.
	4	5240	7 000	7 340	0.40	19 500	45 500	Engaged 20' offcenter.
	4	5240	9 000	9 450	0.52	16 000	43 000	
	6	7000	12 000	12 490	0.50	29 500	63 000	Engaged 30' offcenter. High rail side load - below limits.
	5	7000	12 500	12 680	0.51	12 500	60 500	Engaged 27' offcenter. High rail side load - below limits.
	3	3760	7 000	7 300	0.59	15 000	32 000(C)	Peak extraction force calculated from available data.
	3	3760	3 760	4 020	0.33	4 500	NO DATA	
	3	3760	5 240	5 290	0.42	12 500	14 500	
	5	5240	7 000	7 140	0.39	21 500	39 000	
	5	5240	7 500	7 520	0.40	21 500	39 000	
	4	5240	5 240	5 350	0.29	16 500	36 500	

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TABLE V concluded

GENERAL DATA			PLATFORM DATA				CHUTE DATA			EXTRACTIO			
EXTRACTION NUMBER	AIRSPEED (KIAS)	ALTITUDE (ft msl)	WEIGHT (lb)	LENGTH (ft)	TYPE	PLATFORM[1] CONDITION AFTER EXTRACTION	No USED	TYPE	DIAMETER (ft)	No OF LOCKS SET	TOTAL T O[***] RESTRAINT SETTING (lb)	TOTAL[2] RESTRAINT SET (lb)	TOTAL[2] RESTRAINT MEASURED (lb)
59	110	0	11 900	12	2	S	1	RS'	32	3	3760	6 000	5 800
60	134	7	11 900	12	2	S	1	RS'	32	3	3760	9 000	8 440
61	125	5	13 000	12	3	O	1	RS'	32	3	3760	9 000	8 970
63	129	7	24 900	20	3	O	2	RS'	32	5	7000	12 500	12 960
64	135	5	24 900	20	3	O	2	RS'	32	6	7000	19 500	19 370
65	132	5270	13 000	16	2	-	1	RS	28	5	5240	10 000	9 460
66	132	5330	18 000	16	2	-	1	RS	24	5	5240	8 750	8 520
67	134	5040	18 000	20	3	-	1	RS'	32(R)	6	5000	USED EMERGENCY RELE	
68	129	7	18 000	20	3	O	1	RS'	32(R)	6	5000	10 500	9 710
69	132	5320	25 000	20	2	-	2	RS	28 & 22	6	7000	12 000	12 190
70	127	5330	25 000	20	2	-	1	RS	28	6	7000	9 000	8 490
71	127	5270	25 000	20	3	-	1	RS'	32 (R)	6	7000	USED EMERGENCY RELE	
72	122	2	25 000	20	3	O	1	RS'	32 (R)	6	7000	USED EMERGENCY RELE	
73	112	35	25 000	16	2	S	2	RS'	32	6	7000	19 500	18 570
74	125	3	25 000	20	3	O	2	RS'	32	6	7000	22 500	22 570
75	121	3	18 700	20	3	O	1	RS'	32	5	5240	18 750	18 980
76	127	4	24 800	20	3	O	2	RS'	32	6	7000	13 500	14 460
77	126	2	25 000	20	3	O	2	RS'	32	6	7000	18 000	18 400
78	119	0	25 000	20	3	O	2	RS'	32	6	7000	13 500	14 100
79													
80													
81													

[1] O – No platform damage – reusable.
S – Platform damage but intact – not reusable.
D – Platform completely destroyed.

[2] Assumes no restraint from locks set at 0.25

* 1 – Army Modular Platform
2 – Interim Platform
3 – Metric Platform

** RS – Ring Slot Parachute
RS' Ring Sail Parachute
(R) – Parachute Skirt Reefed

*** T.O. – T.O. 1C–12A–9, Table 4B–2

TABLE V concluded

UTE DATA		EXTRACTION DATA						
TYPE	DIAMETER (ft)	No. OF LOCKS SET	TOTAL T.O. RESTRAINT SETTING (lb)	TOTAL RESTRAINT SET (lb)	TOTAL RESTRAINT MEASURED (lb)	MEASURED RESTRAINT TO WEIGHT RATIO	EXTRACTION FORCE AT LOCK RELEASE (lb)	PEAK EXTRACTION FORCE (lb)	REMARKS
RS'	32	3	3760	6 000	5 800	0.43	15 000	26 500	
RS'	32	3	3760	9 000	8 440	0.71	21 500	39 500	
RS'	32	3	3760	9 000	8 970	0.73	16 500	25 500	Asymmetrically loaded platform.
RS'	32	5	7000	12 500	12 960	0.52	23 500	40 000	
RS'	32	6	7000	19 500	19 370	0.78	27 000	51 000	
RS	28	5	5240	10 000	9 460	0.53	19 000	22 500	1.0 ER airdrop.
RS	24	5	5240	8 750	8 520	0.48	13 700	14 200	0.7 ER airdrop to simulate partial chute failure.
RS'	32 (R)	6	5000	USED EMERGENCY RELEASE -			NO DATA	NO DATA	0.2 ER airdrop to simulate chute failure.
RS'	32 (R)	6	5000	10 500	9 710	0.54	22 500	22 500	0.2 ER extraction to simulate chute failure. Chute 100% reefed. Chute snatch force released locks. One lock did not engage.
RS	28 & 22	6	7000	12 000	12 190	0.49	4 000	30 200	1.0 ER airdrop.
RS	28	6	7000	9 000	8 490	0.34	18 050	21 000	0.7 ER airdrop to simulate partial chute failure.
RS'	32 (R)	6	7000	USED EMERGENCY RELEASE -			7 500	16 500	0.2 ER airdrop to simulate chute failure. Chute was 100% reefed.
RS'	32 (R)	6	7000	USED EMERGENCY RELEASE -			11 000	21 000	0.2 ER extraction to simulate chute failure. Chute was 100% reefed.
RS'	32	6	7000	19 500	18 570	0.74	15 670	NO DATA	
RS'	32	6	7000	22 500	22 570	0.99	NO DATA	47 500 (C)	One chute opened late-caused airspeed loss of about 8 knots.
RS'	32	5	5240	18 750	18 980	1.03	30 000	36 500	Asymmetric load.
RS'	32	6	7000	13 500	14 460	0.58	NO DATA	NO DATA	Broken extraction load pickup wire.
RS'	32	6	7000	18 000	18 400		NO DATA	49 500 (C)	
RS'	32	6	7000	13 500	14 100		NO DATA	39 000 (C)	

S – Ring Slot Parachute
S' Ring Sail Parachute
) – Parachute Skirt Reefed
.O. – T.O. 1C-139A-9, Table 4B-2

2. Insufficient space for adjustment of the lock preload adjusting bolt with the platform in position, especially in the wheel well area.

3. Inadequate lighting in the lock scale area with the platform in position, particularly in the wheel well area.

This range of variation was not considered critical since the locks would normally be set prior to loading of the platform in the airplane. The procedure of setting the locks after platform positioning was followed during the test program to protect the sensitive linkage connecting the latch to the latch position-measuring potentiometer. Normally, the latch release force could be expected to vary from the lock setting by approximately 5 percent, as indicated by laboratory calibrations. Plots of measured release force versus lock settings for the individual locks are shown in figures 10 through 17.

Total aft restraint of the platform provided by the variable-restraint locks when T.O. lock settings were used was usually within 500 pounds of the total restraint set; however, increasing the number of locks engaged and set tended to decrease the measured variation in total aft restraint. Figures 18, 19, and 20 are plots of the total restraint measured versus the total restraint set for Phase I, Phase II, and Phase III tests, respectively. Totals for each test are listed in table V. Data indicated that the variable-restraint locks could be expected to release at approximately the preload setting. Total restraint set was determined by totaling the lock settings on the scale, whereas the total restraint measured was the sum of the forces actually measured by the data transducers. Significantly, the latch release forces correlated with the lock settings. This did not seem to be the case during previous tests conducted by the lock manufacturer (reference 10) and by the 6511th Test Group (Parachute) (reference 8) had indicated that the force required to release the latches was considerably higher than the preset force on the lock. Reference 2, table 4B-2, listed restraint lock settings based on the results of the earlier tests.

Table 4B-2 listed the number of engaged locks which should be set according to platform weight and platform length. These listed T.O. settings required that one, two, or three locks provide the major part of the necessary restraint, depending on platform length and that the remaining locks be set at 0.25 (250 pounds) on the lock scale. Inadvertent release of one of the latches which provided a major part of the restraint would probably result in release of all remaining latches. During Phase I tests the locks set at 0.25 were not considered to provide any significant aft restraint. The lock settings used (twice actual platform weight) provided an actual restraint-to-weight ratio of 0.43 to 0.58, not counting the restraint provided by the locks set at 0.25. For Phase II and Phase III tests using settings for twice the actual weight, the measured restraint provided by the low lock settings was included when the total restraint was computed. This provided a computed restraint-to-weight ratio of 0.60 to 0.65. This higher indicated restraint ratio, was misleading above 0.58, since release of the latches providing the primary restraint would have caused release of all the lower set locks. This was evident during several GPES extractions when the aircraft made ground con-

C-130E USAF S/N 64-0560
A/A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM
LOCK No. 4- ASSEMBLY No. 220

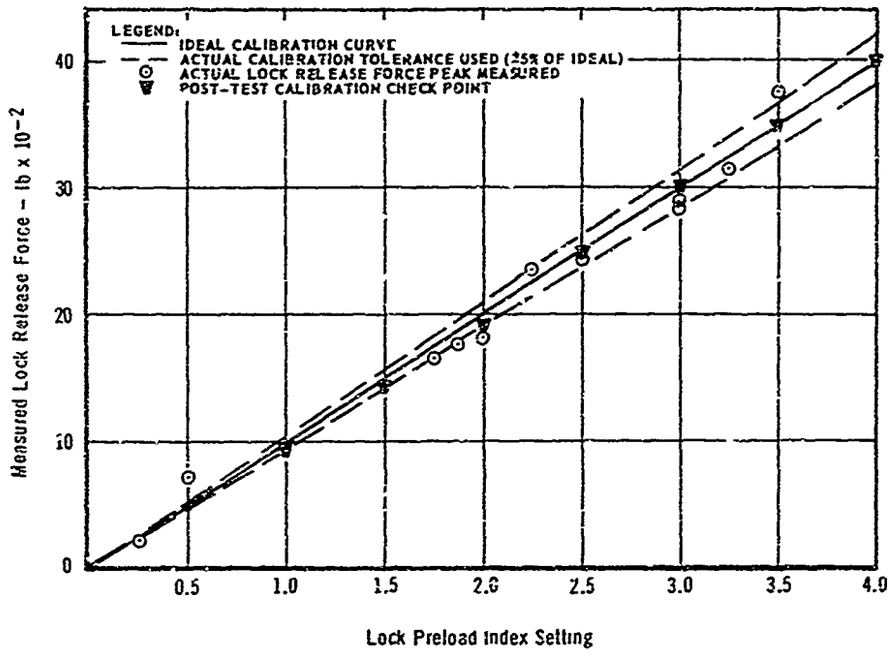


Figure 10 MEASURED LOCK RELEASE FORCE vs LOCK PRELOAD INDEX SETTING LOCK No 4

C-130E USAF S/N 64-0560
A/A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM
LOCK No. 5-ASSEMBLY No. 253

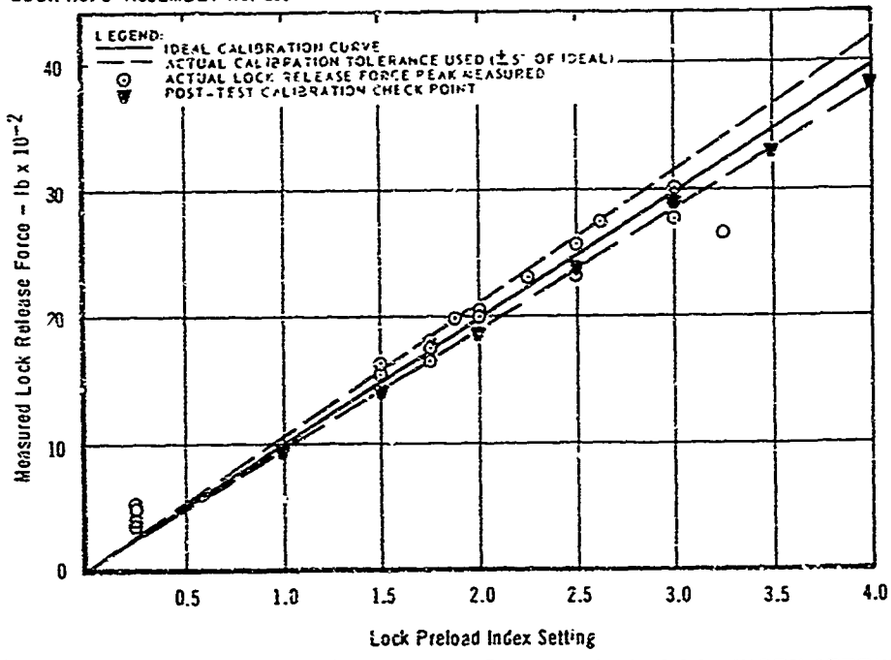


Figure 11 MEASURED LOCK RELEASE FORCE vs LOCK PRELOAD INDEX SETTING LOCK No 5

C-130E USAF S/N 64-0560
A/A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM
LOCK No. 6 -ASSEMBLY No. 811

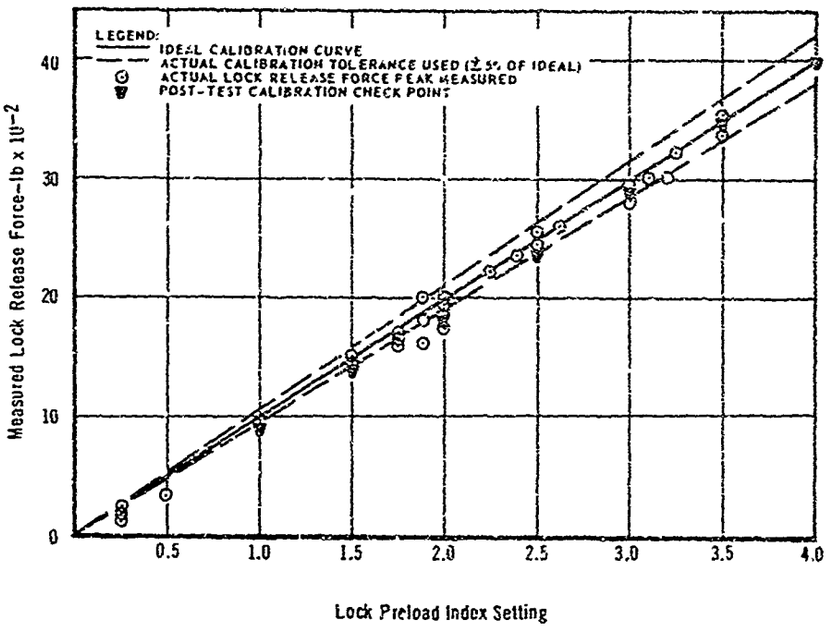


Figure 12 MEASURED LOCK RELEASE FORCE vs LOCK PRELOAD LOCK No 6

C-130E USAF S/N 64-0560
A/A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM
LOCK No. 7-ASSEMBLY No. 737

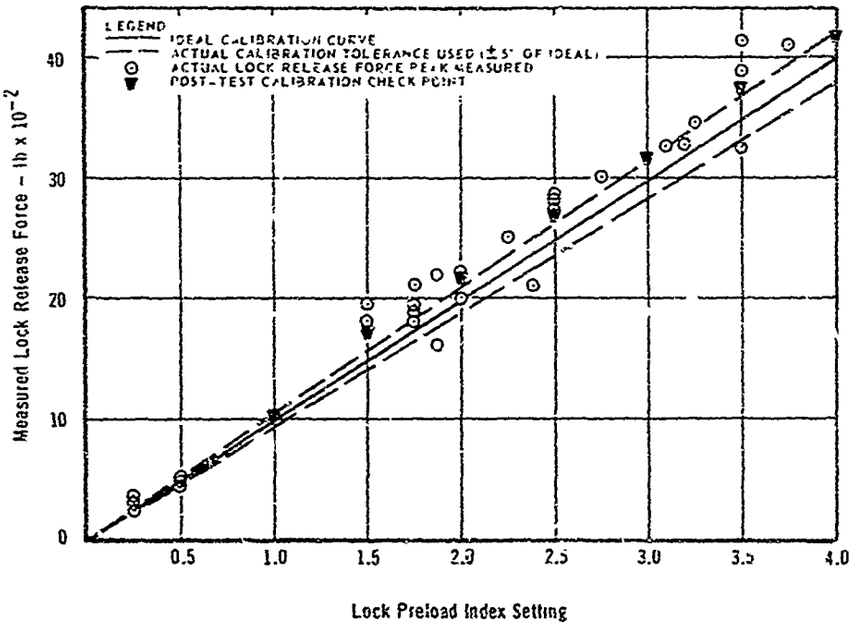


Figure 13 MEASURED LOCK RELEASE FORCE vs LOCK PRELOAD INDEX SETTING LOCK No 7

C-130E USAF S/N 64-0550
A/A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM
LOCK No. 8 - ASSEMBLY No. 784

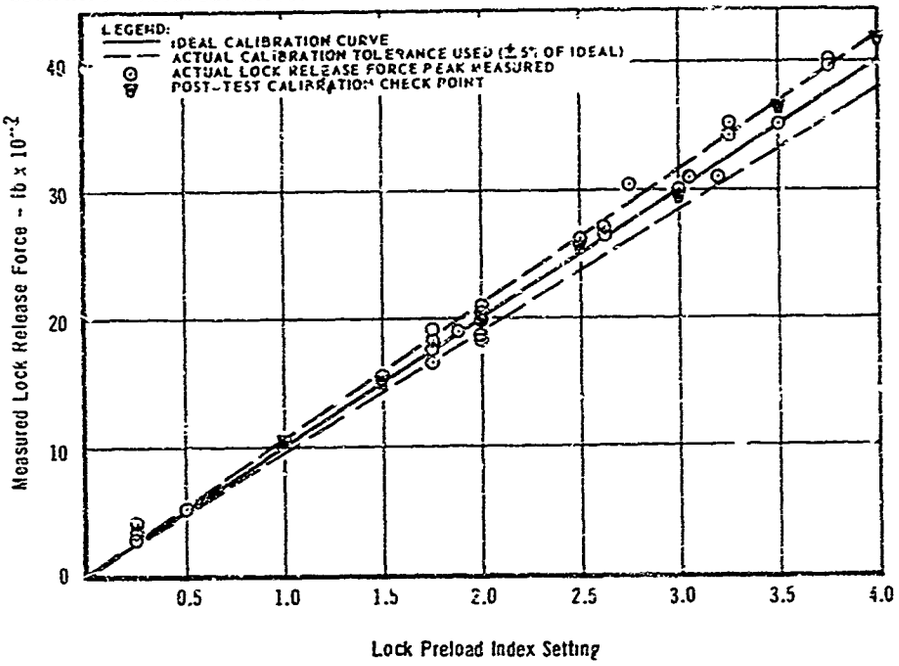


Figure 14 MEASURED LOCK RELEASE FORCE vs LOCK PRELOAD INDEX SETTING LOCK No 8

C-130E USAF S N 54-0560
A A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM
LOCK No. 9 - ASSEMBLY No. 112

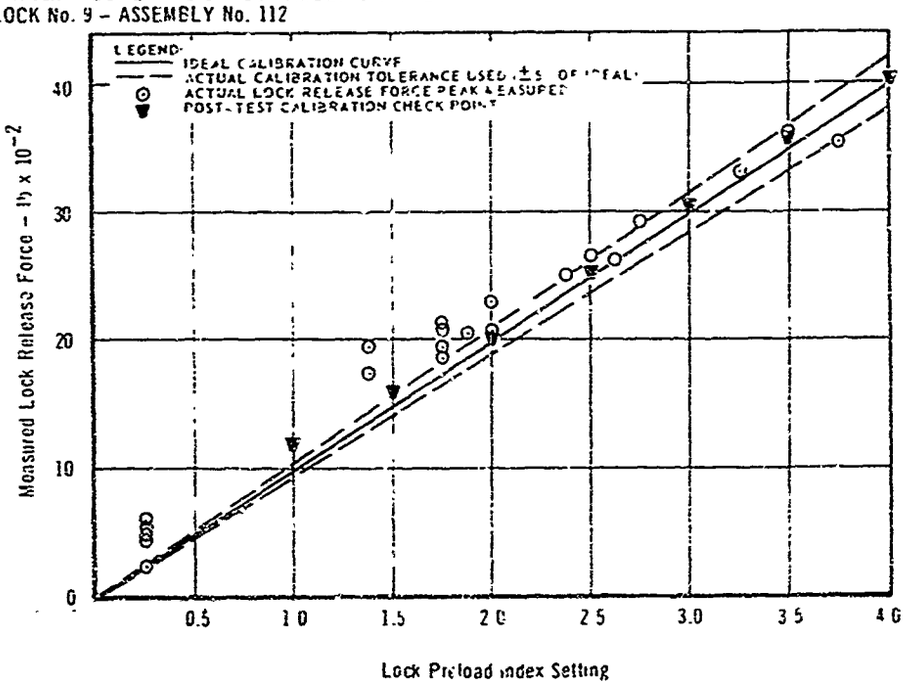


Figure 15 MEASURED LOCK RELEASE FORCE vs LOCK PRELOAD INDEX SETTING LOCK No 9

C-130E USAF S N 64-0560
A A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM
LOCK No 10 - ASSEMBLY No. 183

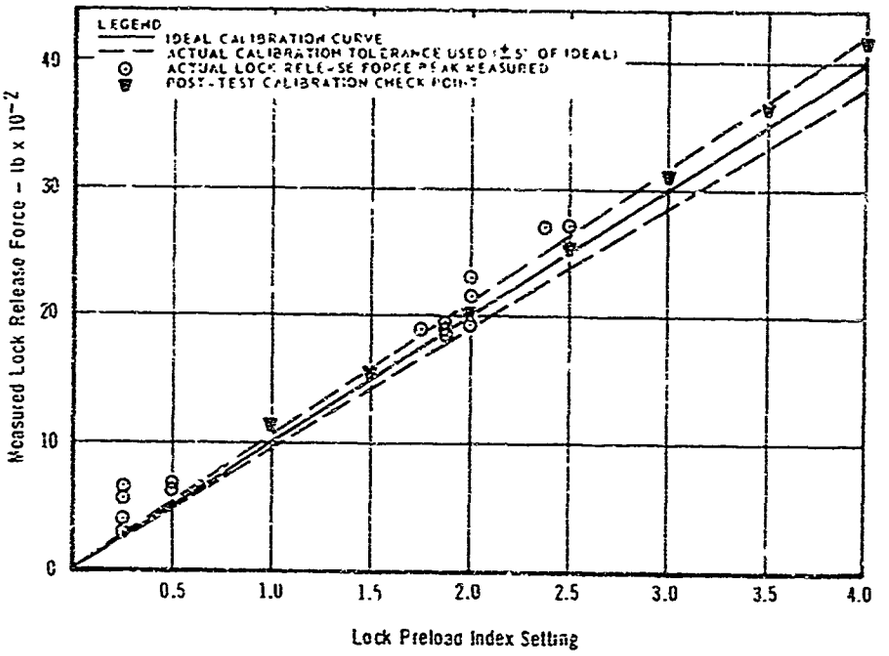


Figure 16 MEASURED LOCK RELEASE FORCE vs LOCK PRELOAD INDEX SETTING LOCK No 10

C-130E USAF S.N 64-0560
A A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM
LOCK No. 11 - ASSEMBLY No 127

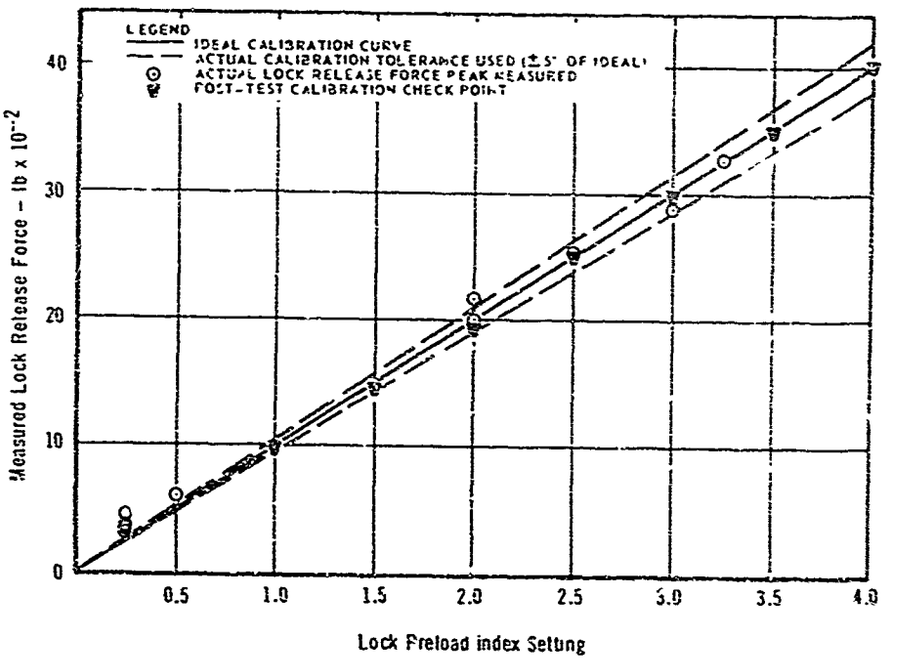


Figure 17 MEASURED LOCK RELEASE FORCE vs LOCK PRELOAD INDEX SETTING LOCK No 11

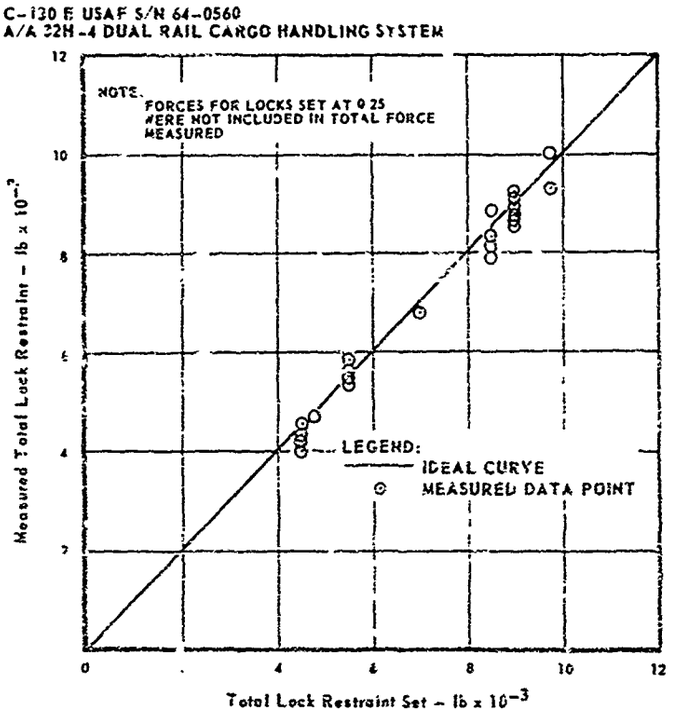


Figure 18 TOTAL LOCK RESTRAINT vs TOTAL RESTRAINT SET – RING SLOT LAPES

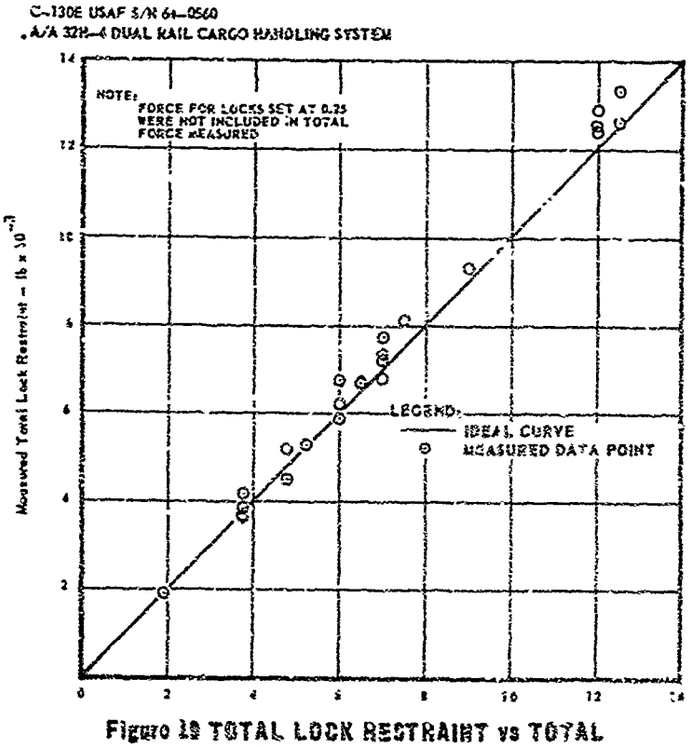


Figure 19 TOTAL LOCK RESTRAINT vs TOTAL RESTRAINT SET – GPES EXTRACTIONS

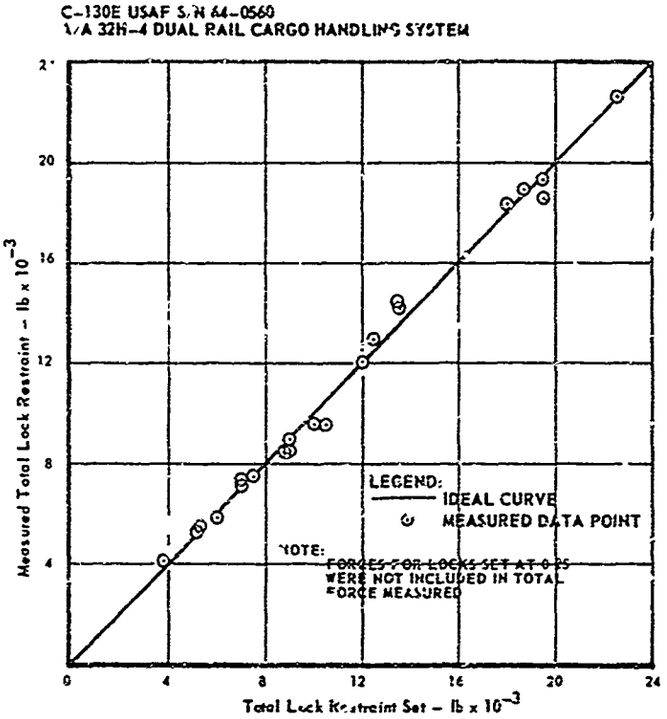


Figure 20 TOTAL LOCK RESTRAINT vs TOTAL RESTRAINT SET – RING SAIL LAPES

tact prior to hook engagement or when more than one pass was necessary before a successful extraction was accomplished. Platform release with a missed engagement would have resulted in an inadvertent gravity drop. On nine occasions, the aircraft contacted the ground with resulting high latch loads. The lock settings being used on these occasions were higher than recommended in the T.O., and the data indicated that inadvertent or premature platform release might have occurred had T.O. lock settings been used (figure 122, appendix I). Higher lock settings on the primary locks did not necessarily insure against premature or inadvertent platform release because the major load was carried by only a minimum of the total number of latches engaged. The following situations illustrated the disadvantage of using only a minimum of the total number of latches engaged to provide the total platform aft restraint:

On extraction number 3, using the LAPES technique, test conditions called for 7000 pounds of restraint and two of three engaged locks were set at 3500 pounds each. One latch did not properly engage and, as a result, total restraint available was only 3500 pounds. The extraction was successful, and no mishap occurred. Had aircraft touchdown occurred along with parachute malfunction, the platform probably would have released, resulting in a gravity drop.

On extraction number 23, using the GPES technique, the extraction hook struck a 3-inch rock on the ground, causing the hook to separate from the boom prematurely. As the airplane crossed

the ground arrestor cable, the extraction line was already fully extended and whipping due to the hook bouncing on the ground. Film coverage revealed that the extraction line momentarily snagged the extraction cable and applied an extraction force to the platform of approximately 10 000 pounds (figure 21). One of the two latches providing the major part of the restraint came within 300 pounds of releasing. Had the applied extraction force been applied for a longer duration, the latch most probably would have released, causing the remaining primary latch to release also.

Based on these observations, the lock settings in table 4B-2 were inadequate for LAPES and GPES delivery methods. (R 10)

Preliminary test results indicated that the best restraint-to-weight ratio was approximately 0.50 and that all locks engaged with the platform should have the same settings (equal lock-setting technique). Additionally, using more locks provided a more uniform aft restraint and provided a safety factor in the event a lock was defective, improperly set, or inadvertently not engaged. Accordingly, table VI was prepared to determine lock settings required for each test based on the number of latches engaged and the total restraint required to provide a restraint-to-weight ratio of 0.50. Table VI was then used on the last ten extractions of Phase II tests (extraction numbers 38 through 47) with the total restraint set to provide a restraint-to-weight ratio

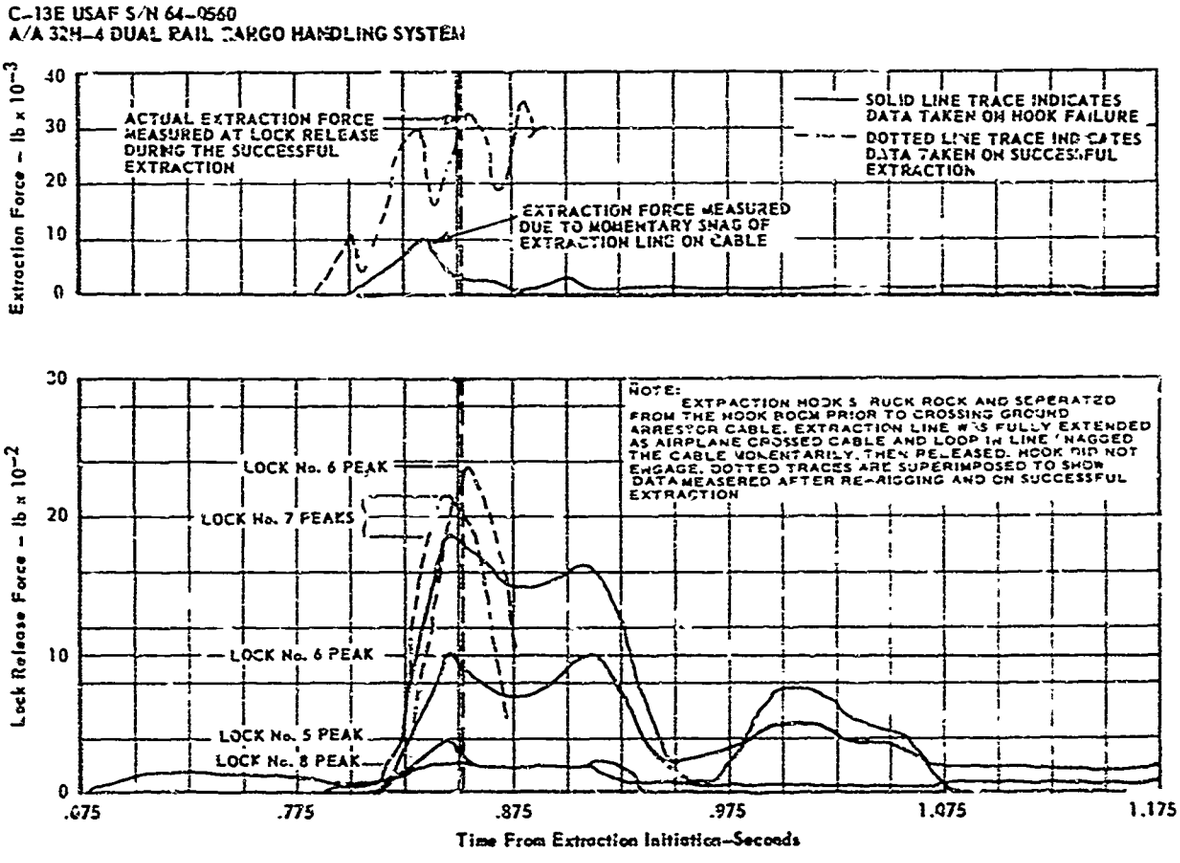


Figure 21 HOOK FAILURE TIME HISTORY, EXTRACTION No. 28

of 0.50. The ratios obtained during these tests were uniform, varying from 0.49 to 0.54 (table V). The effectiveness of this technique was demonstrated on extraction 40 in which a successful extraction was not accomplished until the third pass. The aircraft contacted the ground on the first two passes, causing high lock loads. Had the locks been set as recommended in the T.O., an inadvertent platform release might have occurred. The equal lock-setting technique and greater total restraint evidently prevented inadvertent platform release with a resultant gravity extraction. Technical Order lock settings would have provided a total restraint of 7000 pounds with two locks set at 3.50 and three locks set at 0.25 since five locks were engaged in the 20-foot platform. The equal lock setting technique provided five locks set at 2.50 for a total restraint of 12 500 pounds.

Table VI
TOTAL RESTRAINT PROVIDED BY NUMBER OF LOCKS ENGAGED FOR GIVEN SETTINGS

LOCK SETTING	NUMBER OF LOCKS SET AND ENGAGED							
	2	3	4	5	6	7	8	9
1.00	2 000	3 000	4 000	5 000	6 000	7 000	8 000	9 000
1.25	2 500	3 750	5 000	6 250	7 500	8 750	10 000	11 250
1.50	3 000	4 500	6 000	7 500	9 000	10 500	12 000	13 500
1.75	3 500	5 250	7 000	8 750	10 500	12 250	14 000	15 750
2.00	4 000	6 000	8 000	10 000	12 000	14 000	16 000	18 000
2.25	4 500	6 750	9 000	11 250	13 500	15 750	18 000	20 250
2.50	5 000	7 500	10 000	12 500	15 000	17 500	20 000	22 500
2.75	5 500	8 250	11 000	13 750	16 500	19 250	22 000	24 750
3.00	6 000	9 000	12 000	15 000	18 000	21 000	24 000	27 000
3.25	6 500	9 750	13 000	16 250	19 500	22 750	26 000	29 250
3.50	7 000	10 500	14 000	17 500	21 000	24 500	28 000	31 500
3.75	7 500	11 250	15 000	18 750	22 500	26 250	30 000	33 750
4.00	8 000	12 000	16 000	20 000	24 000	28 000	32 000	36 000

During Phase III testing, except for the first six extractions, the equal lock-setting technique was used to provide restraint-to-weight ratios ranging from 0.50 to 1.0 with the ratios increased incrementaly to 1.0 to determine the ratio required to prevent platform release at initial parachute extraction force. No noticeable effect was observed for ratios between 0.50 and 0.75; however, higher ratios tended to create undesirable parachute drag on the airplane just prior to latch release. This was especially noticeable at platform weights above 18 000 pounds when two extraction parachutes were used. If one parachute was slow in opening, the other parachute did not provide sufficient force to release the latches immediately. The 0.50 restraint-to-weight ratio appeared to be adequate for both LAPES and GPES delivery missions, and consequently table VII was developed. This table lists lock settings which provide a restraint-to-weight ratio of approximately 0.50 for all platform loads from 2500 to 35 000 pounds. This table should be included in reference 2 for use with all LAPES and GPES delivery missions. The table was arranged so that a maximum of five locks are to be set for platform lengths which are capable of engaging more than five latches. This is because lock-latch data indicated that, with more than five latches engaged, the farthest-aft engaged latches tended to ride against the platform rail indent face and received the extraction force before the most forward latches. Apparently, this condition was caused by platform-rail indent spacing tolerances. The prob. was more evident when longer platforms were used for the heavier loads. As a result, the most aft locks released before the most forward. The time required to effect total latch release ranged from 0.015 to 0.33 seconds, depending on the rate of extraction force application. (R 11, R 13)

Table VII

RIGHT HAND LOCK RESTRAINT SETTINGS

A/A32H-4 Dual Rail Cargo Handling System

GPES & LAPES Cargo Delivery*

Platform Gross Wt (lb)	8 Ft. Platform		12 Ft. Platform	16 Ft. Platform	20 Ft. Platform	24 Ft. Platform		28 Ft. Platform
	2 Latches	3 Latches	4 Latches	5 Latches	6 Latches	7 Latches		8 Latches
2 500	1@1.25	- - -						
3 000	1@1.50	1@1.50						
3 500	1@1.75	1@1.75	- - -					
4 000	2@1.00	2@1.00	2@1.00					
4 500	2@1.25	2@1.25	2@1.25					
5 000	2@1.25	2@1.25	2@1.25	- - -				
5 500	2@1.50	2@1.25	2@1.25	2@1.25				
6 000	2@1.50	3@1.00	3@1.00	3@1.00				
6 500	2@1.75	3@1.00	3@1.00	3@1.00	- - -			
7 000	2@1.75	3@1.25	3@1.25	3@1.25	3@1.25			
7 500	2@1.75	3@1.25	4@1.00	4@1.00	4@1.00	- - -		
8 000	2@2.00	2@2.00	4@1.00	4@1.00	4@1.00	4@1.00		
8 500	2@2.25	3@1.50	3@1.50	3@1.50	3@1.50	3@1.50		
9 000	2@2.25	3@1.50	3@1.50	3@1.50	4@1.25	4@1.25		4@1.25
9 500	2@2.50	3@1.50	4@1.25	4@1.25	5@1.00	5@1.00		5@1.00
10 000	2@2.50	3@1.75	4@1.25	4@1.25	5@1.00	5@1.00		5@1.00
10 500	- - -	3@1.75	3@1.75	4@1.25	5@1.00	5@1.00		5@1.00
11 000		2@2.75	3@1.75	3@1.75	5@1.00	5@1.00		5@1.00
11 500		3@2.00	4@1.50	4@1.50	4@1.50	5@1.25		5@1.25
12 000		3@2.00	4@1.50	4@1.50	5@1.25	5@1.25		5@1.25
12 500		3@2.25	3@2.00	4@1.50	5@1.25	5@1.25		5@1.25
13 000		3@2.25	3@2.25	4@1.75	5@1.25	5@1.25		5@1.25
13 500		3@2.25	4@1.75	4@1.75	4@1.75	4@1.75		5@1.25
14 000		3@2.50	4@1.75	4@1.75	4@1.75	5@1.50		5@1.50
14 500		3@2.50	4@1.75	5@1.50	5@1.50	5@1.50		5@1.50
15 000		3@2.50	3@2.50	5@1.50	5@1.50	5@1.50		5@1.50
15 500		3@2.50	4@2.00	5@1.50	5@1.50	5@1.50		5@1.50
16 000		3@2.75	4@2.00	4@2.00	5@1.50	5@1.50		5@1.50
16 500		- - -	3@2.75	3@2.75	4@2.00	4@2.00		4@2.00
17 000			3@2.75	5@1.75	5@1.75	5@1.75		5@1.75
17 500			4@2.25	5@1.75	5@1.75	5@1.75		5@1.75
18 000			4@2.25	4@2.25	4@2.25	4@2.25		4@2.25
18 500			4@2.25	4@2.25	4@2.25	4@2.25		4@2.25
19 000			4@2.25	4@2.25	4@2.25	4@2.25		4@2.25
19 500			4@2.50	5@2.00	5@2.00	5@2.00		5@2.00
20 000			4@2.50	5@2.00	5@2.00	5@2.00		5@2.00

Locks to be set should be the forward most locks that engage the platform rail indents.
Remaining locks are to be set at 0.5 to insure that they remain retracted after lock release.

*This table should be used for GPES and LAPES deliveries only. For standard air drop aerial cargo delivery, use table 4B-2, T.O. 1C-130A-9.

Table VII (Concluded)

RIGHT HAND LOCK RESTRAINT SETTINGS

A/A32H-4 Dual Rail Cargo Handling System

GPES & LAPES Cargo Delivery*

Platform Gross Wt (lb)	12 Ft. Platform		20 Ft. Platform				
	8 Ft. Platform		16 Ft. Platform		24 Ft. Platform		28 Ft. Platform
	2 Latches	3 Latches	4 Latches	5 Latches	6 Latches	7 Latches	8 Latches
20 500			4@2.50	4@2.50	4@2.50	4@2.50	4@2.50
21 000			3@3.50	3@3.50	4@2.50	4@2.50	4@2.50
21 500			4@2.75	4@2.75	4@2.75	4@2.75	4@2.75
22 000			4@2.75	5@2.25	5@2.25	5@2.25	5@2.25
22 500			4@2.75	5@2.25	5@2.25	5@2.25	5@2.25
23 000			- - -	5@2.25	5@2.25	5@2.25	5@2.25
23 500				4@3.00	4@3.00	4@3.00	5@2.25
24 000				4@3.00	4@3.00	4@3.00	5@2.25
24 500				5@2.50	5@2.50	5@2.50	5@2.50
25 000				5@2.50	5@2.50	5@2.50	5@2.50
25 500				5@2.50	5@2.50	5@2.50	5@2.50
26 000				4@3.25	4@3.25	4@3.25	4@3.25
26 500				4@3.25	4@3.25	4@3.25	4@3.25
27 000				5@2.75	5@2.75	5@2.75	5@2.75
27 500				5@2.75	5@2.75	5@2.75	5@2.75
28 000				5@2.75	5@2.75	5@2.75	5@2.75
28 500				4@3.50	4@3.50	4@3.50	4@3.50
29 000				- - -	4@3.50	4@3.50	4@3.50
29 500					5@3.00	5@3.00	5@3.00
30 000					5@3.00	5@3.00	5@3.00
30 500					5@3.00	5@3.00	5@3.00
31 000					5@3.00	5@3.00	5@3.00
31 500					4@3.75	4@3.75	5@3.00
32 000					5@3.25	5@3.25	5@3.25
32 500					5@3.25	5@3.25	5@3.25
33 000					5@3.25	5@3.25	5@3.25
33 500					5@3.25	5@3.25	5@3.25
34 000					5@3.25	5@3.25	5@3.25
34 500					5@3.50	5@3.50	5@3.50
35 000					5@3.50	5@3.50	5@3.50

Locks to be set should be the forward most locks that engage the platform rail indents. Remaining locks are to be set at 0.5 to insure that they remain retracted after lock release.

* This table should be used for GPES and LAPES deliveries only. For standard air drop aerial cargo delivery, use table 1B-2, T.O. 1C-130A-9.

The lock latch position data indicated that, when lock settings of 0.25 were used, the latch spring force was inadequate to prevent the latches from partially reextending into the platform-rail indents after latch release. This resulted in a series of impacts on the lock latch as the platform moved aft during extraction. As a corrective measure, the lock spring index was set at approximately 0.50 on the scale, i.e., with the adjusting bolt at least finger tight since no scale increment mark was provided between 0.25 and 1.0 (figure 6, appendix II). With this setting, the latch remained retracted after release. The magnitude of restraint provided by this low setting varied from 200 to 600 pounds; however, this

was insignificant compared to the restraint provided by the major set locks. Accordingly, table VII specifies that, when more than five locks are to be engaged, the remaining locks are to be set at approximately 0.50. A 0.50 increment should be marked on the lock scale and the 0.25 increment should be eliminated to prevent future guesswork on the part of operating personnel. The feasibility of using table VII lock settings for standard aerial delivery missions should be studied. (R 12, R 14)

On two occasions during the test program, the latch of an engaged and set lock failed to correctly engage with the platform rail indent. Determination of correct latch engagement consisted of visually checking that the emergency release finger in the lock mechanism was correctly positioned. This discrepancy is discussed in detail under the System Deficiencies section of this report.

6 Conveyor-Rollers and Teeter-Rollers

The conveyor-rollers were instrumented to determine the vertical loads imposed on the rollers during LAPES and GPES extractions. The conveyor-roller loads were measured at five random positions along the right-hand outboard conveyor rail. Four of the instrumented conveyor rollers were located on the airplane cargo floor. The fifth roller was located just aft of the airplane ramp lateral centerline. Additionally, the four teeter-rollers on each conveyor rail at the aft ramp edge were instrumented to obtain the vertical loads imposed as the extracted platform "teetered" on these rollers.

All roller loads were measured using a special roller shaft designed and manufactured by Strainsert Company, Bryn Mawr, Pennsylvania, under Air Force contract AF04(611)-11324. The special shafts were identical to the regular roller shafts, except that they included an internal strain gage at each end to measure the load transferred from the roller shell to the shaft. A flange machined on one end of the special shaft allowed it to be bolted to the roller mounting rail (figure 7, appendix II), thereby preventing the shaft from rotating with the roller during platform extraction. This eliminated any torque loads on the shaft and allowed only direct vertical loads to be measured.

The instrumented conveyor-roller shafts were laboratory tested and calibrated to record loads from zero to 5000 pounds. The limit load on the regular conveyor-rollers was 4500 pounds, and the design load was 3000 pounds (references 10 and 11).

The instrumented teeter-roller shafts were laboratory tested to 10 000 pounds and were calibrated to record loads from zero to 10 000 pounds. The latter value was used as the limit load since specific design load information was not available (appendix II).

All conveyor-roller loads measured were well below the 3000-pound design load. The maximum conveyor-roller load measured during any extraction was 2500 pounds and was measured on the ramp roller during a LAPES extraction of an 18 000-pound load. The method of platform extraction (LAPES or GPES) did not cause any significant variation in roller loads. There was no noticeable deformation of any of the rollers or of the roller shaft mounting holes on either the outboard or intermediate conveyor rails. Measured conveyor-roller load versus platform load weight are shown in figure 22.

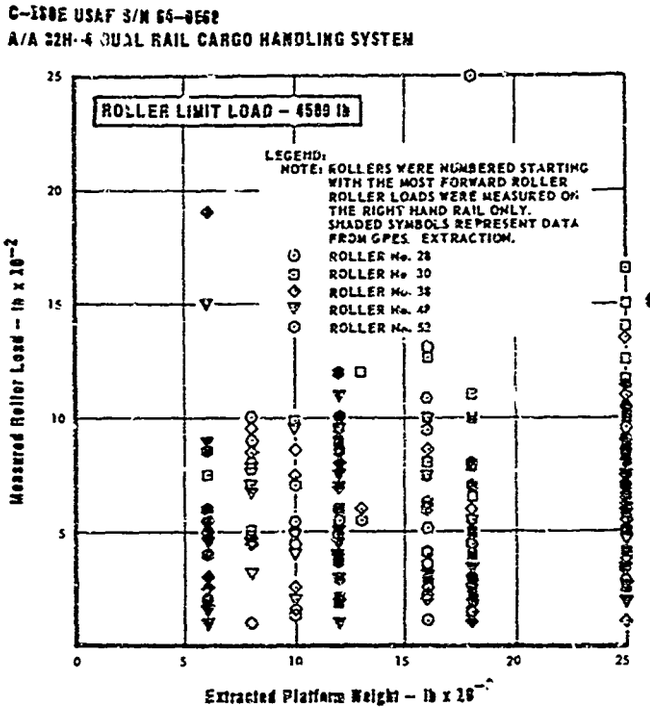


Figure 22 CONVEYOR-ROLLER LOADS - LAPES & GPES

All teeter-roller loads measured were well below the arbitrary limit load of 10 000 pounds. The highest teeter-roller load measured was 6300 pounds on the left-hand outboard teeter-roller during a LAPES extraction of a 25 000-pound load. There was no noticeable deformation of the rollers or of the roller-shaft mounting holes on either the outboard or intermediate conveyor rails. The data indicated that the two intermediate teeter-rollers normally carried the major portion of all loads extracted. Loads measured on the intermediate teeter-rollers ranged from 1000 to 4200 pounds, depending on the weight of the extracted load. Measured teeter-roller load versus platform load weight is shown in figure 23 for LAPES extractions and in figure 24 for GPES extractions. The data indicated that the rollers would withstand the loads to be expected during LAPES and GPES extractions.

Maximum roller rpm was calculated using recorded maximum platform velocity during each extraction. The measured velocities ranged from 20 to 77 feet per second, and the corresponding calculated roller rpm ranged from 2000 to approximately 8000. The highest platform velocities occurred during GPES extractions.

Outboard Conveyor Rail Side Loads

The outboard conveyor rails were instrumented to determine the magnitude of dynamic point side loads imposed by the corners of a skewed platform during extraction. Secondary objectives were to determine the effect of the dynamic loads on the rail crossmembers and to determine if skewed platforms affected latch-release and extraction forces.

The outboard conveyor rails were instrumented at four points: fuselage stations 450, 527, 647 and 790. These points on both rails provided the best rail deformation data because the lack rail tiedown crossmembers forward or aft of the points made them the weakest points in the system (figure 8, appendix II).

Rail side load instrumentation consisted of a strain gage mounted at the center point of the rail section between the forward and aft tiedown crossmembers at each selected fuselage station. The strain gage orientation provided sensitivity to lateral rail deformation resulting from a horizontal side load imposed at that point. After installation of the rail system in the airplane, the side load transducers were calibrated by use of a special apparatus designed and fabricated at the AFFTC. Each position was calibrated to record direct horizontal side loads ranging from zero to 6000 pounds. Although the rail was designed to withstand

C-130E USAF S/N 64-0550
A/A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM

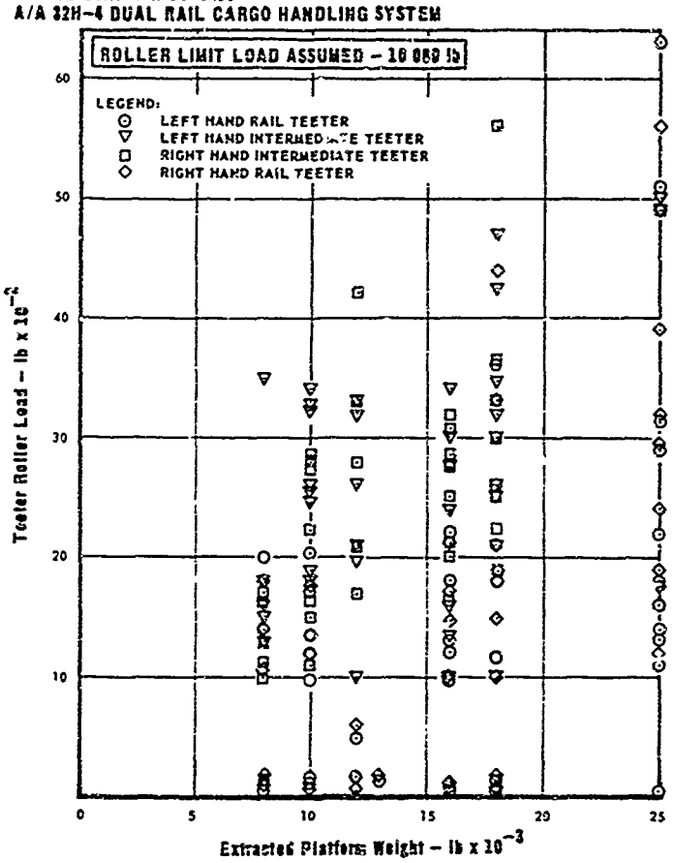


Figure 23 TEETER-ROLLER LOADS – LAPES EXTRACTION

C-13E USAF S/N 64-0550
A/A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM

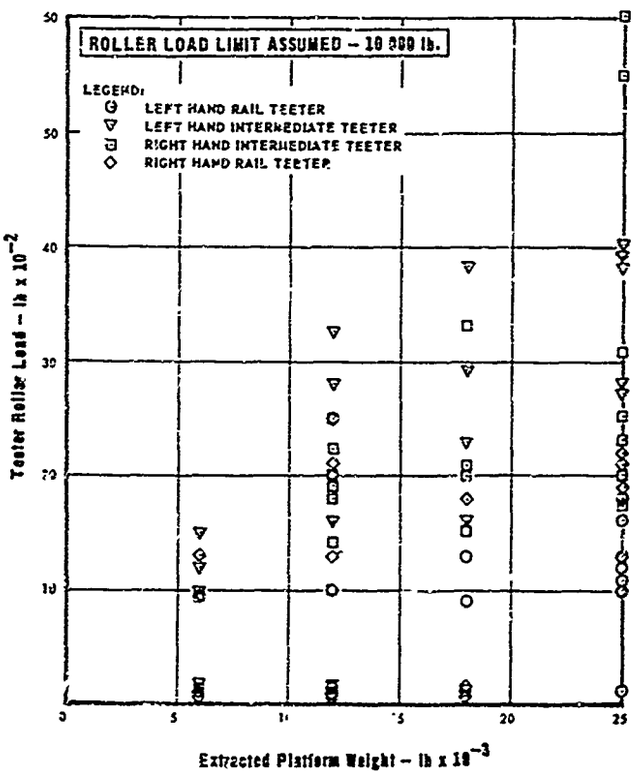


Figure 24 TEETER-ROLLER LOADS – GPES EXTRACTIONS

a direct horizontal side load of 15 000 pounds and had been statically tested for this load by the manufacturer (reference 10), the zero to 6000-pound calibration was accomplished to provide better resolution of the dynamic loads. A recalibration of the rail side-load transducers could have been made, if necessary, if the LAPES and GPES extraction tests resulted in loads greater than the calibrated range.

Tests were devised to deliberately cause high side loads to the rails during extraction. On three GPES extractions, the platform was loaded with the load cg laterally displaced from the platform longitudinal centerline. Side loads measured during extraction of these asymmetric loads were 1700, 1830, and 1400 pounds. Deliberate off-center hook/cable engagements of up to 30 feet were made on two GPES extractions. The maximum side loads measured were 1400 and 2400 pounds. Two LAPES extractions made with an asymmetrically loaded platform resulted in measured side loads of 800 and 1000 pounds.

The side loads measured during all other extractions ranged from approximately 100 to 2000 pounds, depending on the platform length and load weight being extracted and were more severe for the longer platform lengths. Measured side loads versus platform length are shown in figure 25.

All side loads measured were below the rail side load limit of 15 000 pounds. The highest side load recorded was 2400 pounds. Asymmetric positioning of the load on the platform or lateral offset of the extraction line from the airplane longitudinal centerline did not impose significant side loads on the conveyor lateral-restraint rails. The side load data indicated that the loads would not impose any undue stresses on the rail tiedown crossmembers during LAPES or GPES extractions.

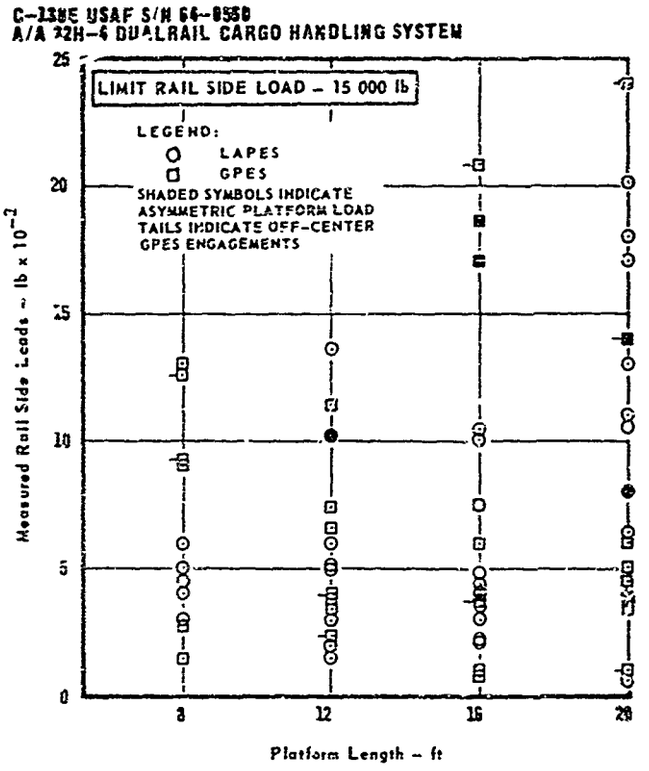


Figure 25 PEAK SIDE LOADS vs PLATFORM LENGTHS -LAPES & GPES EXTRACTIONS

Platform Movement, Extraction Rate, and Extraction Force

Platform movement was measured to determine the range of platform forward and aft travel while restrained and to determine the total aft platform movement required to effect right-hand latch release.

Platform movement was measured with rectilinear potentiometer capable of measuring 1-inch of total travel. The potentiometer was secured in a bracket immediately forward of the positioned load platform (figure 9, appendix II). The potentiometer plunger

was positioned at approximately one-half of its range of travel and taped to the platform forward edge so that it separated from the platform after approximately 1/2-inch of aft platform travel.

The data indicated that during taxi, takeoff and flight the platform fore and aft movement was restricted to the 1/4-inch allowed by the tolerance between the restraint latches and the platform-rail indents with both the right- and left-hand latches engaged. With the left-hand latches disengaged, total aft movement of the platform to effect latch release ranged from 0.30 to 0.35 inch.

Platform acceleration was measured from time of latch release until the platform left the airplane ramp. This measurement was taken to determine the extraction rate of the platform and the approximate conveyor-roller rpm at maximum platform velocity.

Acceleration of the platform was measured by two methods. One method utilized a 1/64-inch diameter steel cable wound on a balanced drum reel (figure 10, appendix II). Magnets mounted on the drum activated a magnetic pickup on every one-half revolution of the drum, causing a spike deflection on the oscillograph record for each foot of platform travel.

Platform position and acceleration were also measured by use of magnets mounted on the top of the right-hand lateral restraint rail at 1-foot intervals. Magnetic pickups mounted on the fore and aft right-hand platform corners (figure 9, appendix II) were activated as the pickup passed over each magnet, causing a spike deflection on the oscillograph record. This determined the position of the platform fore and aft edges at any time during the extraction, and also served as the second platform acceleration measurement.

Maximum platform velocities during all extractions ranged from 20 to 77 feet per second, depending on the rate of extraction force buildup, platform position in the airplane, and method of extraction. The platform velocity was highest during GPES extractions and ranged between 49 and 77 feet per second. Generally, the data indicated that tipoff velocities ranging between approximately 45 and 65 feet per second should be expected for normal LAPES and GPES cargo deliveries.

The platform extraction force was measured to determine the force required to overcome the force applied to the platform by the variable-restraint locks and to observe the effect, if any, on the extraction force of varying the lock settings and of skewed or asymmetrically-loaded platforms. The extraction force applied by the parachute or by the ground arrestor was measured using a strain gaged link installed between the platform extraction clevis and the extraction line tie link (figure 11, appendix II). Links designed and calibrated for load ranges of zero to 30 000 pounds and zero to 70 000 pounds were used, depending on platform load weight and method of extraction.

The extraction force necessary to effect latch release was usually close in magnitude to the load weight rather than to the total restraint applied tothe platform for restraint-to-weight ratios below 0.75.

During LAPES extractions, the variable-restraint locks frequently released at the application of the initial extraction force, commonly referred to as the parachute snatch

force, which was originally believed to be caused by the initial opening shock of the extraction parachute. Film from the on-board cameras, when correlated with oscillograph data, showed that the snatch force was actually caused by the inertial force of the parachute and extraction line mass. Once deployed, the extraction parachute, drogue parachute, and extraction line floated aft until the extraction line was fully extended, at which time the airplane snatched the floating mass and accelerated it to the speed of the airplane. Platform release occurred when the snatch force exceeded the sum of the platform retarding force and total latch restraint and was applied for sufficient duration to cause the platform to move aft more than 0.3 inch. If the snatch force/time relationship did not result in a 0.3-inch aft platform movement, the restraint latches held the platform restrained until the extraction force increased with parachute inflation, causing latch release. Extraction force at latch release on LAPES extractions was approximately the same for a given load weight regardless of whether latch release occurred during parachute snatch force or whether it occurred during extraction force buildup. The measured extraction force at latch release was usually close in magnitude to the load weight. Peak extraction force depended on the size and number of parachutes used for extraction and on the airplane airspeed at extraction. Lateral parachute travel during extraction did not noticeably affect the force provided by the LAPES extraction parachutes.

On GPES extractions, force provided by the ground arrestor was considerably higher throughout the extraction than that measured during LAPES tests. The rate of extraction force buildup from extraction initiation to platform separation from the airplane was also greater for GPES extractions. Increasing total platform restraint, offcenter hook/cable engagements, or aircraft yaw during extraction did not noticeably affect the extraction force provided by the ground arrestor.

Time histories for each extraction showing latch-release force and extraction force during latch release are shown in appendix I. Time histories for each extraction from extraction initiation to separation of the platform from the airplane are shown in figure 26. These time histories show that for Phase I and Phase II tests, RS LAPES and GPES, the time from extraction initiation to platform separation was fairly consistent within each phase, with the differences resulting primarily from the different airplane airspeeds at extraction. During Phase III tests, the RS' parachute blossoming times were unpredictable and the time interval from extraction initiation to platform separation varied.

C-23AE USAF S/N 84-0550
A/A 32H DUAL RAIL CARGO HANDLING SYSTEM
EXTRACTIONS 1 THROUGH 32

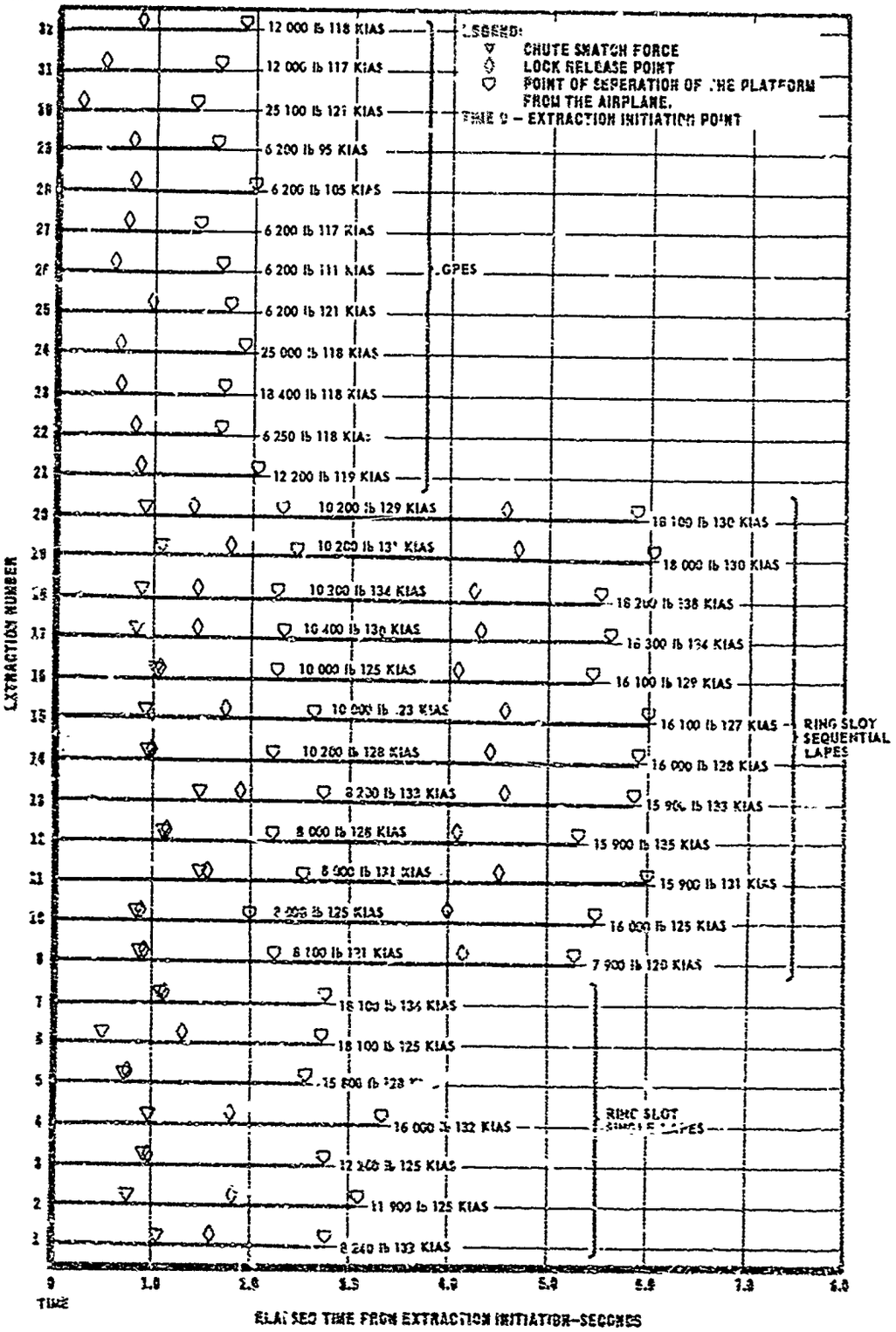


Figure 26 ELAPSED TIME HISTORY-LAPES A GPES EXTRACTIONS

C-130E USAF S/N 64-0560
A/A 32H-4 DUAL RAIL CARGO HANDLING SYSTEM
EXTRACTIONS 33 THROUGH 69

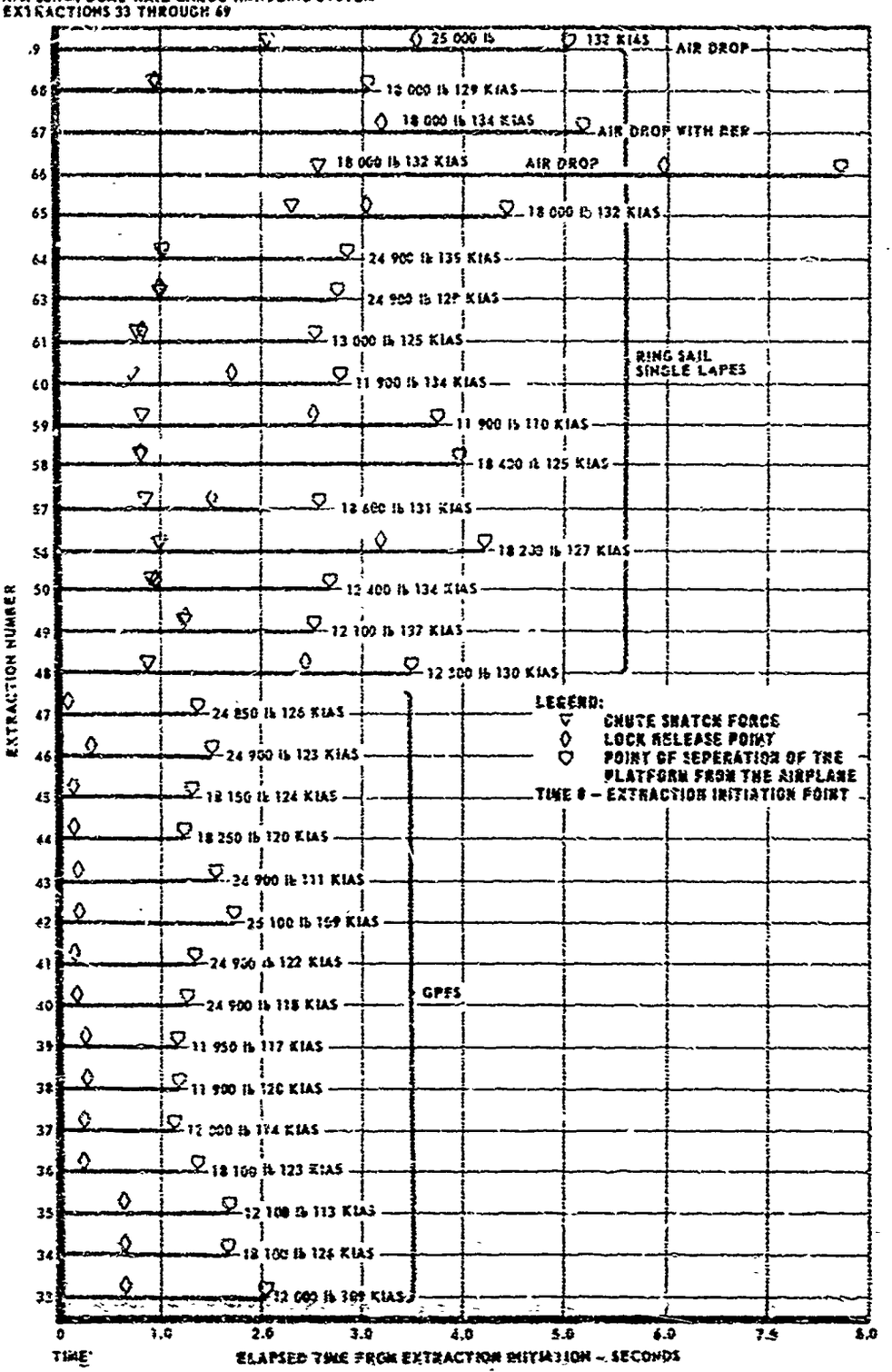


Figure 20 continued ELAPSED TIME HISTORY-LAPES & GPES EXTRACTIONS

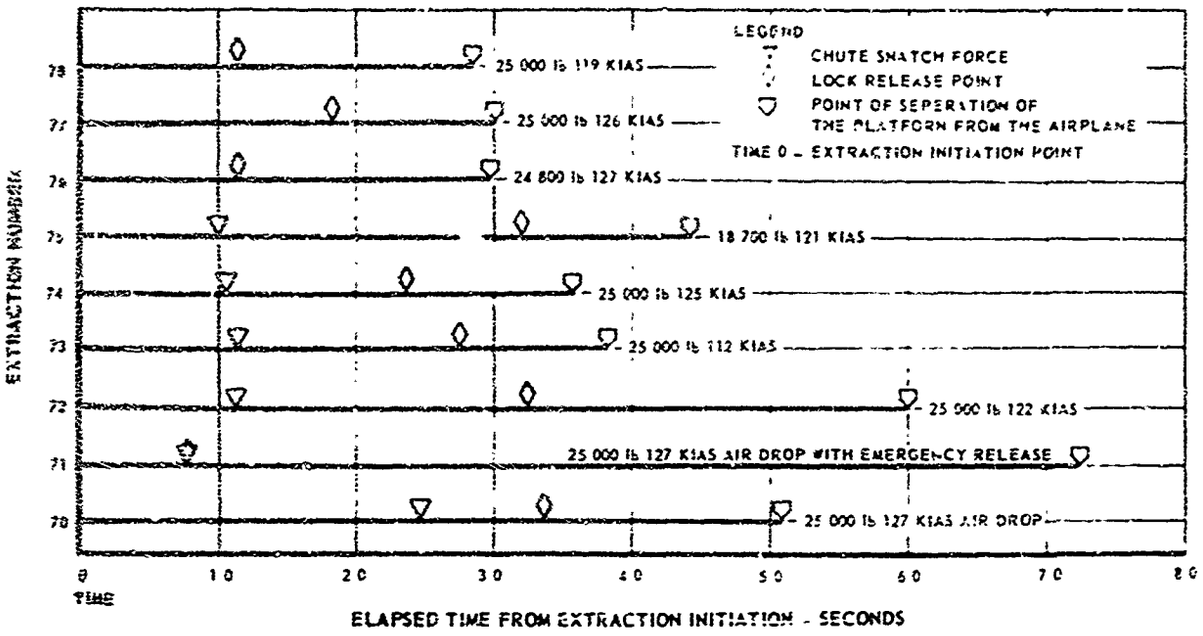


Figure 26 concluded – ELAPSED TIME HISTORY – RING SAIL LAPES

- **rail spacing**

Transverse spacing of the outboard conveyor rails was measured before and after each extraction up to the end of Phase II tests to determine if there was any change in the rail spacing of 108 ±1/8 inches during extraction. The measurement was made immediately after completion of the platform rigging in the airplane just prior to takeoff, and again immediately after landing following the extraction. The transverse rail spacing was measured at five points: immediately forward and aft of the platform; immediately forward and aft of the ramp hinge; and at the aft end of the ramp rails. The measurements were made using a device designed and fabricated at the AFFTC. The device consisted of two sections of steel tubing which could be butted together and locked. One section of tubing was fitted with a semiround end which was used as a pivot. The other section was fitted with a dial indicator which was calibrated in 0.001-inch increments. The device was accurate to ±0.001 inch.

Measurements taken throughout Phase I and Phase II tests indicated that the rail spacing did not vary more than 1/16 of an inch at any time before and after an extraction. The rail side loads resulting from transverse extraction line angles caused by lateral parachute travel during LAPES tests and by the offcenter engagements during GPES tests did not noticeably affect the transverse spacing tolerance of the outboard conveyor rails.

- **platform action during extraction**

Platform action during each extraction was recorded using three onboard cameras automatically controlled by the DATA-ON/OFF switch at the main instrumentation panel. All three cameras were operated at 400 frames per second. The camera positions were:

1. Pylon-Mounted Camera - This camera was mounted on the trailing tip of the left external tank. It

was set to provide coverage of the platform as it crossed the ramp.

2. Cargo Compartment Camera - This camera was mounted overhead inside the cargo compartment to record any platform skewing or lateral offset of the extraction line.

3. Table Mounted Camera - This camera was mounted on the photopanel table and was oriented to record any lifting of the platform as it crossed the ramp.

The film records indicated that the extraction line was usually not offset more than 5 degrees from the airplane centerline. The greatest lateral offset occurred during GPES extractions and was caused by airplane yaw due to crosswinds. Offcenter GPES engagements did not cause any significant extraction line offset. During LAPES extractions, the extraction parachute sometimes traveled transversely during extraction; however, the lateral travel usually did not cause more than approximately 5 degrees of extraction-line offset.

SYSTEM DEFICIENCIES

Variable-restraint locks

There were no adequate visual means of positively insuring that the latches of all variable-restraint locks that were set to provide platform restraint were correctly engaged with the platform rail indent. During two extractions, a supposedly engaged and set lock actually did not provide any measurable restraint (figures 92 and 148, appendix I). On both occasions, the emergency release finger in the lock mechanism had been visually checked to see that it was in the correct position between the lower rocker arm roller and the plunger roller (figure 27).

The emergency release finger was placed into position by use of the right-hand manual control handle. This handle had four positions: LOAD, EMERGENCY, NORMAL, and CHECK. During loading of the platform, the handle was in the LOAD position. This retracted all the latches to allow the platform to be rolled forward. Once the platform was positioned, the handle was put in the NORMAL position. This extended the latches so that they engaged the platform rail indents. If all latches were not engaged, the platform was pushed fore and aft until all latches engaged. The control handle was then put in the CHECK position. This supposedly insured that all latches were fully engaged, since the control handle should not go into the CHECK position unless all latches were fully engaged. However, the emergency release finger could be positioned without the latch being fully engaged, and a visual check of this finger did not insure full latch-to-indent engagement.

Both the right- and left-hand outboard conveyor rails had a platform vertical-restraint flange (figure 12, appendix II) which extended over the platform rail indent and completely covered the indent and the latch so that neither was visible with the platform in place. The vertical-restraint flange ended just aft of the No. 10 latch face. Therefore, all the latches except No. 11 were completely covered and could not be checked to insure full latch engagement.

When as few as two of the total number of engageable locks were set to provide the required

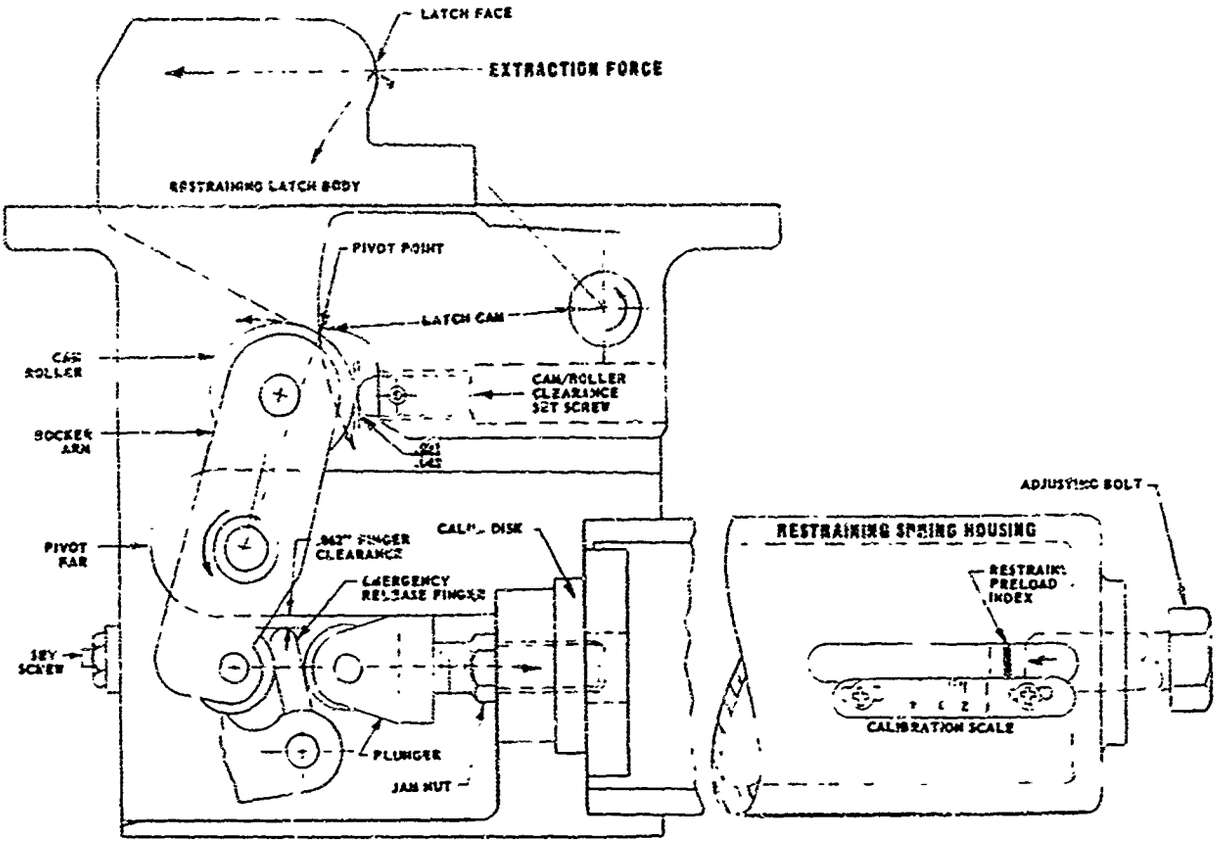


Figure 27 A/A32H-4 VARIABLE-RESTRAINT LOCK MECHANISM

platform restraint, as recommended in table 4B-2, reference 2, the failure of one of the set locks to engage correctly could result in the loss of 50 percent of the required restraint. This occurred during extraction No. 3 when one of the two set locks did not engage correctly. The required restraint-to-weight ratio was 0.58, but with one latch not engaged, the actual measured ratio was 0.27. If more engageable locks were set equally to provide the total restraint, the loss of one latch would not be as critical, as indicated during extraction No. 68 when one of six latches did not engage correctly. In this instance, the desired restraint-to-weight ratio was 0.58. Loss of one latch resulted in a theoretical restraint-to-weight ratio of 0 49, which would still have been adequate to restrain the load. The measured ratio was 0.54. Equal settings on a maximum number of engageable variable-restraint locks, as provided in table VII, would reduce the amount of restraint lost if one latch did not engage correctly.

A more positive visual check for latch engagement with the platform rail should be provided. A possible modification could consist of providing a slot in the right-hand conveyor rail vertical restraint flange over each latch position so that the latch face and the indent face are visible with the platform in position (figure 28). The visible part of the latch should be painted yellow so that it would be more visible when extended with the platform in position. (R 15, R 16)

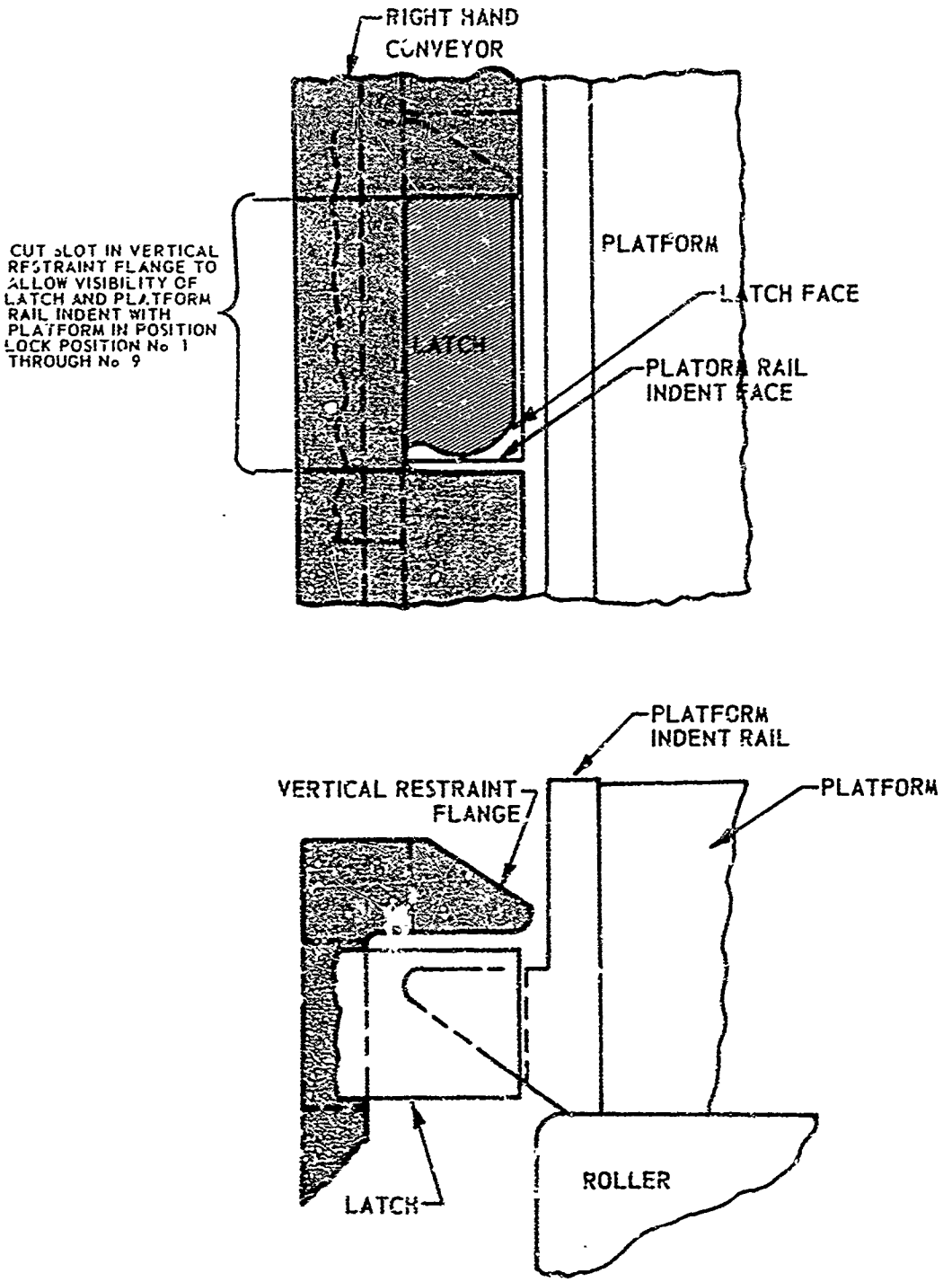
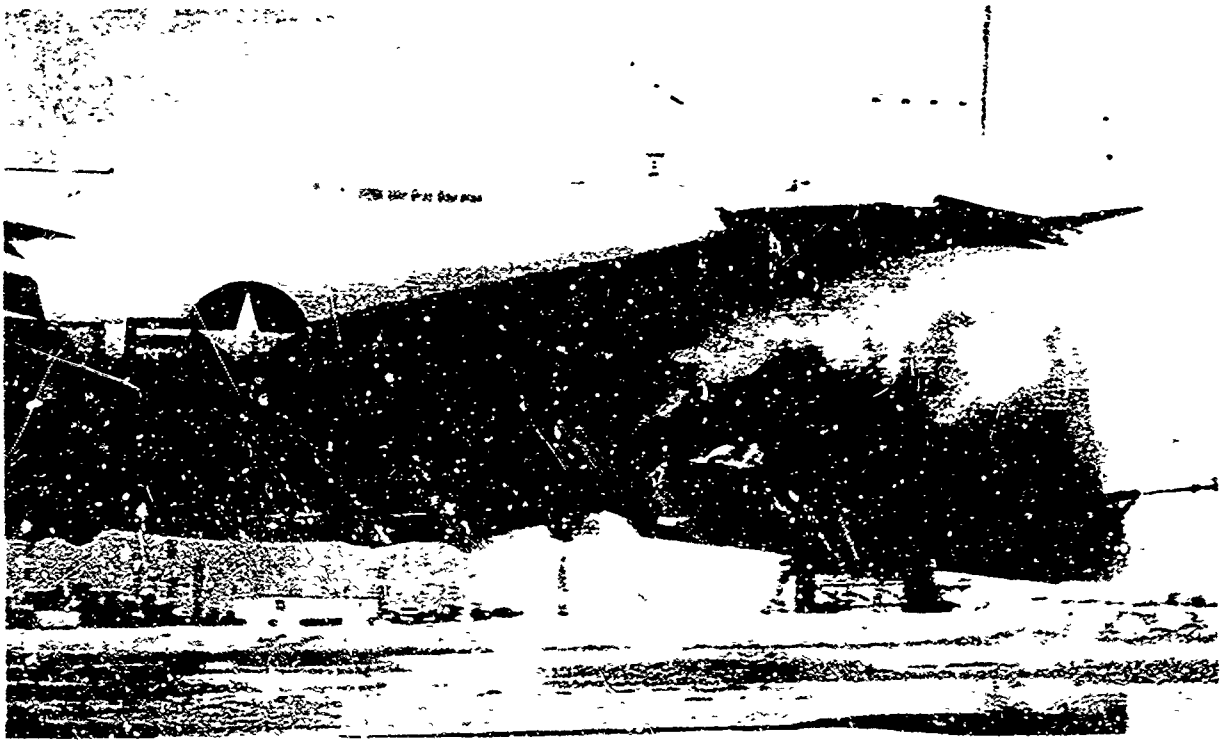


Figure 23 PROPOSED MODIFICATION TO RIGHT-HAND CONVEYOR RAIL VERTICAL RESTRAINT FLANGE



CONCLUSIONS AND RECOMMENDATIONS[6]

STABILITY AND CONTROL

No unsatisfactory stability and control characteristics were encountered above 1.2 V_S during either the single or sequential LAPES cargo deliveries with normal extraction ratios or during the GPES tests. The pilot noted only slight airplane responses while delivering loads weighing less than 12 000 pounds. The airplane responses during extraction of 18 000- and 25 000-pound loads were mild. The ranges of the airplane gross weight and center of gravity during the LAPES and GPES deliveries presented no unsatisfactory airplane handling characteristics. Airdrops at 5000 feet altitude were found to produce more airplane reaction than the LAPES deliveries during the tests at low extraction ratios. However, the pitch rates and longitudinal control inputs required to control the pitch rates during airdrops and low altitude deliveries were moderate and acceptable for operational situations in which a malfunction might reduce the extraction forces to those tested.

1. The C-130E airplane should be cleared for LAPES and GPES deliveries. The airplane gross weight without the load should be within the range tested (93 000 to 115 000

[6] Aeronautical Systems Division and Systems Engineering Group personnel have reviewed and concurred with these recommendations.

pounds). The airplane center of gravity should be within the limits shown in figure 1, appendix II before and after extraction. The extraction system should provide at least 2000 pounds extraction force for an 18 000-pound load and 5000 pounds for a 25 000-pound load in the event of a worst possible single extraction system failure (pages 11 and 13).

Airspeeds used for GPES tests were 1.15 V_S and 1.2 V_S for a given configuration and indicated airspeeds required for 130 knots groundspeed. The minimum airspeed at which a GPES extraction could be safely made was 1.2 V_S. Airplane handling characteristics for GPES performed at airspeeds of 1.2 V_S and higher were considered satisfactory.

2. The indicated airspeed that corresponds with 130 knots groundspeed (ground arrestor limit) should be used for GPES deliveries. If wind conditions are such that the arrestor gear will be approached at less than 1.2 V_S in order to remain below 130 knots groundspeed, the extraction should be conducted on a reciprocal heading, terrain permitting, to take advantage of the headwind (page 14).

Aim airspeeds used for LAPES tests were 1.2 V_S, 130 KIAS, and 140 KIAS. The airplane handling characteristics while performing LAPES tests at these speeds were satisfactory. The higher airspeeds, 130 and 140 KIAS, gave the pilot more roundout or flare capability during the transition from a maximum effort descent to the extraction altitude. The higher airspeed also tended to shorten the climbout distance. However, not enough tests were performed at 140 KIAS to determine the effects of this higher speed on parachute reliability and load survivability. Therefore, speeds above 130 KIAS cannot be recommended.

A pitch attitude at trim as near zero as possible was preferred if a steep approach was required. Pitch attitudes at trim less than zero or higher than 5 degrees could be tolerated if touchdown could be positively avoided.

3. LAPES deliveries should be performed at airspeeds between 1.2 V_S and 130 KIAS. If a minimum distance descent or climbout is required to clear obstacles at either end of the extraction zone, the aim extraction airspeed should be 130 KIAS (page 14).

4. If a steep approach to the extraction zone is required, the airplane pitch attitude should be as close to zero as possible on final approach with power set as required for level flight at the aim extraction airspeed. This should be accomplished by varying the wing flap setting (page 15).

Airplane reaction to the extraction was slightly reduced if the airplane wheels were rolling on the ground during the extraction. There is a possibility, however, of damaging the tires or the bottom of the airplane if a touchdown is made on rough terrain. Also, on GPES deliveries damage to the arrestor cable or airplane could result due to the cable bouncing into the underside of the airplane after the tires rolled over it.

5. Intentional touchdown on unimproved surfaces is not recommended during a delivery (page 15).

Moderate turbulence (defined as 5 to 8 KIAS fluctuation on the pilot's airspeed indicator) presented no significant airplane handling problems during these tests. The maximum crosswinds encountered during these tests, 6 to 7 knots, produced no significant handling problems.

No lateral-directional disturbances were noted while extracting LAPES and GPES loads deliberately rigged off center asymmetrically. The cg of these loads was displaced up to 10 inches from the platform centerline for a 24 800-pound load. No noticeable airplane or load effects were observed during several GPES engagements that were intentionally made up to 30 feet from the center of the arrestor cable.

The extraction zone lengths determined during these tests were based on the following considerations and techniques. On the GPES tests, the airplane descended from a 50-foot height to the extraction point, the hook engaged the arrestor cable and the load was extracted. When the loadmaster called "load away," MRP was applied and the airplane was rotated to and climbed at 20 degrees noseup pitch attitude. The airspeed was allowed to bleed off to maximum effort obstacle clearance speed calculated from the Flight Manual using airplane weight with the load aboard. The LAPES zone distances were determined similarly with the exception of the descent. The descents for LAPES extractions were initiated from 100 feet to insure that the drogue parachute cleared a 70-foot obstacle when it was initially deployed. (The drogue parachute when deployed on final approach may drop 20 feet below the airplane.) The airplane towed the drogue parachute during the LAPES descents. The total distance to descend from a 50-foot height, perform a GPES delivery, and climb to a 50-foot height was 2120 feet. A total of 2570 feet were required to climb to a 200-foot height. For single LAPES deliveries, the total distance to descend from 100 feet (70-foot obstacle) and climb to a 50-foot height was 3170 feet; to climb to a 200-foot height, 3620 feet. The zone lengths for sequential LAPES deliveries were about 550 feet longer than for the single LAPES deliveries. All the above distances were based on standard day, sea level, no wind conditions at 130 KIAS until climbout was initiated. The airplane gross weight ranged from 110 000 to 130 000 pounds on descent and was approximately 100 000 pounds on climbout.

6. The airplane should be rotated after extraction to approximately 20 degrees noseup pitch attitude if it is required to clear an obstacle on climbout. The airspeed can be bled off to the maximum effort obstacle clearance speed or in-flight minimum control speed as presented in the Flight Manual, whichever will be greater. The minimum speed should be based on the weight of the airplane with the cargo load on board (page 18).

7. Extraction zone length charts should be placed in the C-130E Flight Manual. These charts should be based on the data contained in this report with the exception of the climbout distance which should be based on the gross weight of the airplane with the load on board (page 18).

With the equipment tested, if a drogue parachute force transfer malfunction occurred during a LAPES test, the airplane had to tow the drogue parachute from the extraction zone. The drag from the 15-

foot D_o RS parachute seriously reduced the climb performance of the airplane in the delivery configuration. Sawtooth climb tests performed with MRP at 2000 feet pressure altitude and 139 000 pounds airplane weight while towing a drogue parachute, showed that the rate of climb was maximum at 121 KCAS on a standard day and was 880 feet per minute. This was calculated to be 540 feet per minute less than if the drogue parachute were not being towed.

8. A release device should be installed in the extraction system so that the drogue parachute could be jettisoned in the event of a malfunction which would prevent drogue parachute force transfer to the extraction parachute(s). An additional drogue parachute should then be carried in the airplane for another extraction attempt should the malfunction be correctable in flight. If it is not practical to install a release device for the drogue parachute, the climbout data placed in the Flight Manual should be based on towing a drogue parachute from the extraction zone (page 18).

The airspeed calibrations in ground effect obtained during these tests were 1 to 4 knots different from those obtained during the C-130E Category II Performance tests at landing touchdown. This difference was attributed to the fact that power for level flight was used on the low level deliveries while flight idle power was used on the landings.

9. The airspeed calibration in ground effect data presented in this report should be used in calculating the maximum allowable indicated airspeed for GPES deliveries (page 20).

DUAL RAIL SYSTEM

The A/A32H-4 Dual Rail Cargo Handling System was suitable for use in the C-130E airplane for LAPES and GPES delivery missions.

The variable-restraint locks released when the aft force applied to the latch was within approximately 5 percent of the restraint set into the lock by use of the lock-index scale and the adjusting bolt. Total restraint provided by the variable-restraint locks was approximately equal to the sum of the settings which were preset into all the engaged locks.

The variable-restraint lock settings listed in T.O. 1C-130A-9, table 4B-2, were inadequate to prevent inadvertent or premature platform release during LAPES and GPES delivery missions. Twice the values shown in the T.O. were required to give adequate restraint to the load. A safer and more uniform latch release force was obtained if all the engaged locks were set at an equal value to give a 0.50 restraint-to-weight ratio. Due to pallet and latch tolerances the maximum number of locks which should be set was determined to be five. Test data indicated that the aftmost latches released first when more than five latches were engaged.

10. Table 4B-2, T.O. 1C-130A-9, should be identified for use only with aerial delivery missions (page 33).

11. Table VII in this report should be included in T.O. 1C-130A-9 and identified for use with LAPES and GPES delivery missions only (page 34).

12. A study should be conducted to determine the feasibility of using Table VII of this report for aerial delivery missions also (page 37).

13. When more than five latches are engaged with the platform, the locks to provide aft platform restraint should be set starting with the most forward lock engaged with the platform (page 34).

The spring force provided to the variable-restraint locks at an index-scale setting of 0.25 was insufficient to keep the latches fully retracted. A setting of approximately 0.50 kept the latches retracted.

14. An 0.50 increment should be marked on the lock scale and the 0.25 increment should be eliminated to prevent any future guesswork on the part of operating personnel (page 37).

There was no positive means of visual inspection to insure that a latch was fully engaged with the platform-rail indent when the platform was positioned in the airplane.

15. Consideration should be given to modification of the vertical restraint flange on the right-hand conveyor rail so that each latch face and the platform-rail indent face are visible with the platform in position (page 47).

16. The visible portion of the extended latch should be painted yellow to increase visibility of the latch in the platform rail indent (page 47).

Conveyor-roller and teeter-roller designs were adequate to withstand all vertical roller loads that can be expected during LAPES and GPES delivery of individual loads weighing up to 25 000 pounds.

The lateral restraint rails were sufficiently strong to withstand all side loads that were caused by a skewed platform during LAPES or GPES extractions.

With both left- and right-hand latches engaged with the platform, total fore and aft platform movement was restricted to a maximum of 0.25 inch.

Aft platform movement ranging from 0.30 to 0.35 inch was required to effect latch release.

Lock settings which provided a restraint-to-weight ratio higher than 0.75 were not advisable for LAPES extractions due to the undesirable loss in airplane airspeed caused by the parachute drag prior to lock release.

T.O. 1C-130A-9, section IVB, changed 9 December 1964, contained redundant and inconsistent terminology used to describe components of the A/A32H-4 Dual Rail Cargo Handling System.

17. An editorial review and subsequent revision of section IVB, T.O. 1C-130A-9, should be accomplished to eliminate existing confusion concerning nomenclature of Dual Rail Cargo Handling System Components (page 4).

The lock calibration procedures supplied by the manufacturer were used and found inadequate. Detailed comments and recommended procedures are contained in appendix III.

18. The lock calibration procedures contained in appendix III should be incorporated in the appropriate manual (page 20).

APPENDIX I

DATA ANALYSIS METHODS AND PLOTS

Descents were corrected to zero wind conditions using equation 6.403 of reference 5. Climb-out distances over 50- and 200-foot obstacles were corrected to standard day sea level conditions and to the power output of the T56-A-7 engines used in the C-130E Category II Performance Tests (reference 3) by use of equation 6.339 of reference 5.

Sawtooth climb data with a 15-foot D_o RS drogue parachute being towed were corrected to a standard day at 2000 feet pressure altitude by use of equations outlined in chapter 5 of reference 5. The data were also corrected for the difference in output between the engines on the test airplane and the engines used during the C-130E Category II tests.

Airspeed calibration data in ground effect were obtained by adding the headwind component to the Askania phototheodolite ground speed at extraction. This speed was then multiplied by the square root of the air density ratio ($\sqrt{\sigma}$) to obtain the calibrated airspeed at sea level.

All extractions were accomplished in the delivery configuration: gear down, ramp and ramp door open, flaps 50, 70 or 100 percent, and power for level flight. The 15 foot D_o RS drogue parachute is not listed in tables I and III nor on the LAPES time histories where it was not attached to the load (flights 1 through 20 and 48 through 50). Engine power was held constant on all LAPES and GPES tests from descent round-out until approximately one second after the last load had left the airplane.

The longitudinal acceleration trace on the time histories is the indicated acceleration along the airplane axis and should be multiplied by cos θ to obtain horizontal acceleration. "Outside Air Temperature" on the time histories is ambient temperature.

The instrumentation pitch attitude gyro was not fully erected at trim where a pitch attitude trim point is not presented on the LAPES and GPES time histories.

C-130E USAF S/N 64-0560
A/A32N-4 Rail System

Flight	1	2	3	4	5	6
Date	28 Feb 66	1 Mar 66	2 Mar 66	3 Mar 66	4 Mar 66	7 Mar 66
Airplane Gross Weight After Extraction (lb)	106 800	102 700	102 500	104 700	104 500	106 200
Flap Position (pct)	50	50	50	50	50	50
Extraction Load Wt (lb)	8200	11 900	12 200	16 000	15 800	18 100
Predrop cg (pct MAC)	25.1	24.6	25.3	24.7	25.0	24.5
Postdrop cg (pct MAC)	25.2	24.6	25.0	24.4	25.1	24.5
Indicated Airspeed (kt)	131	123	123	132	128	125
Radar Alt at Extr (ft)	4	1	1	2	3	3
Extraction Parachutes No.	1	1	2	1	2	2
Extraction Parachutes Dia	28 ft	28 ft	28 ft	28 ft	28 ft	28 ft
Extraction Parachutes Type	RS	RS	RS	RS	RS	RS
Extraction Ratio	1.7	1.0	0.88		1.2	1.0
Ambient Temp (deg C)	22.0	17.0	14.5	15.5	22.5	30.0
Pressure Altitude (ft)	-110	-130	-45	-60	-320	-470
Headwind (kt)	0	24.0	13.0	0	-6.0	-2.0
Right Crosswind (kt)	0	0	0	0	1.0	0

Table I. Summary of RS APES Test Conditions

C-130E USAF S/N 64-0560
A/A22H-4 Rail System

Flight		7	8	9	10	11	12
Date		8 Mar 66	11 Mar 66	14 Mar 66	15 Mar 66	16 Mar 66	17 Mar 66
Airplane Gross Weight After Extraction (lb)		106 200	105 100	104 500	103 300	103 700	103 800
Flap Position (pct)		70	50	70	70	70	70
Extraction Load Wt (lb)		18 100	9100/7900	8200/11 600	8000/18 000	8000/15 800	8000/15 960
Predrop cg (pct MAC)		25.1	25.2	24.2	24.3	25.0	24.4
Postdrop cg (pct MAC)		25.3	23.0 25.3	21.3 24.6	20.1 24.3	21.3 25.6	20.4 24.4
Indicated Airspeed (kt)		134	121.0 120.5	132.0 131.0	128.0 126.0	131.5 131.0	126.0 125.0
Radar Alt at Extr (ft)		6	1.5 2.5	2.0 ---	1.0 1.0	6.0 8.0	4.0 5.0
Extraction Parachutes	No.	2	1/1	1/1	1/1	1/1	1/2
	Dia	28 ft	28 ft	28 ft	28 ft	28 ft	28 ft
	Type	RS	RS	RS	RS	RS	RS
Extraction Ratio		---	---/1.5	---	1.3/1.0	1.7/0.96	1.7/1.6
Ambient Temp (deg C)		33.0	32.5	31.0	31.0	30.0	28.5
Pressure Altitude (ft)		-110	-230	-30	-30	-70	-200
Headwind (kt)		-2.0	3.0	-0.5	-2.0	0	-4.0
Right Crosswind (kt)		0	0	0	0	0	3.0

Table I (continued)

C-130E USAF S/N 64-0560
A/A32H-4 Rail System

Flight		13	14	15	16	17	18
Date		18 Mar 66	21 Mar 66	22 Mar 66	23 Mar 66	24 Mar 66	25 Mar 66
Airplane Gross Weight After Extraction (lb)		103 900	103 100	103 100	103 800	102 100	102 800
Flap Position (pct)		70	70	70	70	70	70
Extraction Load Wt (lb)		8200/15 900	10 200/16 000	10 000/16 100	10 000/16 100	10 400/16 300	10 200/18 200
Predrop cg (pct MAC)		25.4	24.4	24.1	23.8	25.0	25.0
Postdrop cg (pct MAC)		21.5 25.4	18.7 24.1	18.4 24.2	18.3 23.5	19.2 24.7	18.7 24.7
Indicated Airspeed (kt)		133.5 133.0	128.0 128.5	123.0 127.0	125.5 129.0	130.0 134.0	134.0 138.5
Radar Alt at Extr (ft)		4.0 1.5	5.5 6.5	1.0 1.5	1.0 1.5	0 0	5.0 5.5
Extraction Parachutes	No.	1/2	1/1	1/1	1/1	1/2	1/2
	Dia	28 ft	28 ft	28 ft	28 ft	28 ft	28 ft
	Type	RS	RS	RS	RS	RS	RS
Extraction Ratio		1.8/1.5	1.4/0.94	1.6/0.97	1.0/1.4	1.8/1.5	1.7/1.5
Ambient Temp (deg C)		29.2	29.5	26.1	23.5	23.8	23.5
Pressure Altitude (ft)		-210	10	-140	-120	15	-80
Headwind (kt)		4.0	-7.5	-2.0	-2.0	-1.0	-1.0
Right Crosswind (kt)		0	0	3.0	1.0	1.0	-1.0

Table I (continued)

C-130E USAF S/N 64-0560
A/A32H-4 Rail System

Flight		19	20				
Date		28 Mar 66	29 Mar 66				
Airplane Gross Weight After Extraction (lb)		103 000	102 700				
Flap Position (pct)		70	70				
Extraction Load Wt (lb)		10 200/18 000	10 200/13 100				
Predrop cg (pct MAC)		25.8	24.9				
Postdrop cg (pct MAC)		19.8 25.2	19.0 24.5				
Indicated Airspeed (kt)		131.5 130.5	129.5 130.0				
Radar Alt at Extr (ft)		3.0 5.0	4.5 5.0				
Extraction Parachutes	No.	1/2	1/2				
	Dia	28 ft	28 ft				
	Type	RS	RS				
Extraction Ratio		1.7/1.4	1.4/1.3				
Ambient Temp (deg C)		31.5	33.0				
Pressure Altitude (ft)		-200	-25				
Headwind (kt)		0	-1.0				
Right Crosswind (kt)		-0.5	0.5				

Table I (concluded)

C-130E USAF S/N 64-0560
A/A32H-4 Rail System

Flight	21	22	23	24	25	26
Date	5 Apr 66	6 Apr 66	7 Apr 66	8 Apr 66	11 Apr 66	14 Apr 66
Airplane Gross Weight After Extraction (lb)	103 300	102 900	100 300	101 500	102 400	103 700
Flap Position (pct)	50	50	50	50	50	50
Extraction Load Wt (lb)	12 200	6250	18 400	25 000	6200	6200
Predrop cg (pct MAC)	24.5	25.5	24.6	24.6	29.4	23.9
Postdrop cg (pct MAC)	24.4	25.5	24.6	24.6	26.1	27.2
Indicated Airspeed (kt)	119.0	116.5	116.0	116.5	121.5	111.5
Radar Alt at Extr (ft)	3.0	2.0	3.5	1.0	2.0	1.0
Number of Attenuator Units	1	1	2	2	1	1
Extraction Ratio	1.3	---	---	1.9	3.2	2.2
Ambient Temp (deg C)	29.0	31.5	32.0	31.5	27.5	37.0
Pressure Altitude (ft)	-100	-20	-10	-20	45	10
Headwind (kt)	-4.0	-3.0	0	-4.0	0	0
Right Crosswind (kt)	0	-2.0	-4.0	-4.0	6.0	5.0

Table II. Summary of GPES Test Conditions

C-130E USAF S/N 64-0560
A/A32H-4 Rail Syatem

Flight	27	28	29	30	31	32
Date	15 Apr 66	19 Apr 66	20 Apr 66	21 Apr 66	22 Apr 66	25 Apr 66
Airplane Gross Weight After Extraction (lb)	103 000	109 800	100 200	102 100	101 300	101 800
Flap Position (pct)	50	50	100	100	100	50
Extraction Load Wt (lb)	6100	6200	6200	25 100	12 000	12 000
Predrop cg (pct MAC)	27.4	15.6	21.3	23.6	18.7	24.6
Postdrop cg (pct MAC)	23.7	16.8	16.5	15.6	16.3	17.1
Indicated Airspeed (kt)	117.0	105.0	95.0	121.0	117.5	118.0
Radar Alt at Extr (ft)	3.0	5.0	3.0	2.0	2.0	1.0
Number of Arrestor Units	1	1	1	2	1	1
Extraction Ratio	---	1.4	---	1.8	1.8	---
Ambient Temp (deg C)	34.5	24.0	23.0	28.0	30.0	35.0
Pressure Altitude (ft)	---	80	-160	40	0	-75
Headwind (kt)	-4.0	10.0	-1.0	1.0	1.0	0
Right Crosswind (kt)	3.0	0	4.0	3.0	-2.0	-2.0

Table II (continued)

C-130E USAF S/N 64-0560
A/A32H-4 Rail System

Flight	33	34	35	36	37	38
Date	26 Apr 66	27 Apr 66	28 Apr 66	29 Apr 66	2 May 66	3 May 66
Airplane Gross Weight After Extraction (lb)	99 600	102 000	102 600	102 500	103 400	100 600
Flap Position (pct)	100	50	50	50	50	50
Extraction Load Wt (lb)	12 000	18 100	12 100	18 000	11 900	11 900
Predrop cg (pct MAC)	18.5	27.0	24.7	19.8	19.2	18.3
Postdrop cg (pct MAC)	16.1	16.4	17.2	15.9	16.2	15.6
Indicated Airspeed (kt)	109.0	126.5	113.0	123.0	114.0	120.0
Radar Alt at Extr (ft)	1.0	0	1.0	2.0	1.0	0
Number of Arrestor Units	1	2	1	2	2	2
Extraction Ratio	1.4	2.3	1.7	1.9	3.5	2.9
Ambient Temp (deg C)	38.5	32.5	30.0	30.5	40.0	37.5
Pressure Altitude (ft)	120	120	80	70	25	20
Headwind (kt)	5.0	1.0	-1.5	0	-4.0	-2.0
Right Crosswind (kt)	-6.0	3.0	-1.0	0	-3.0	-2.0

Table II (continued)

C-130E USAF S/N 64-0560
A/A32H-4 Rail System

Flight	39	40	41	42	43	44
Date	4 May 66	5 May 66	6 May 66	9 May 66	10 May 66	11 May 66
Airplane Gross Weight After Extraction (lb)	101 400	99 000	101 000	102 500	102 300	93 100
Flap Position (pct)	50	70	70	70	70	50
Extraction Load Wt (lb)	11 900	24 900	24 900	25 100	24 900	18 200
Predrop cg (pct MAC)	19.2	27.1	23.4	23.4	28.4	28.7
Postdrop cg (pct MAC)	15.6	14.5	15.0	15.4	15.5	23.0
Indicated Airspeed (kt)	117.0	118.5	122.0	109.5	111.5	120.5
Radar Alt at Extr (ft)	5.0	1.0	2.5	0	1.0	2.0
Number of Arrestor Units	2	2	2	2	2	2
Extraction Ratio	2.7	1.6	1.7	0.94	1.1	1.8
Ambient Temp (deg C)	32.5	30.5	28.5	25.5	25.5	26.5
Pressure Altitude (ft)	-20	-40	-40	50	-60	40
Headwind (kt)	-2.0	1	-2.0	15.0	8.0	0
Right Crosswind (kt)	-1.0	-1.0	-1.0	3.0	-2.0	-3.0

Table II (continued)

C-130E USAF S/N 64-0580
A/A32H-4 Rail System

Flight	45	46	47			
Date	12 May 66	13 May 66	16 May 66			
Airplane Gross Weight After Extraction (lb)	102 200	102 800	104 300			
Flap Position (pct)	70	70	70			
Extraction Load Wt (lb)	18 200	24 900	24 900			
Predrop cg (pct MAC)	19.7	28.5	19.9			
Postdrop cg (pct MAC)	25.0	23.4	24.9			
Indicated Airspeed (kt)	124.0	123.0	126.0			
Radar Alt at Extr (ft)	3.0	3	1.0			
Number of Arrestor Units	2	2	2			
Extraction Ratio	1.0	1.7	1.7			
Ambient Temp (deg C)	27.0	33.0	30.0			
Pressure Altitude (ft)	0	20	0			
Headwind (kt)	2.0	-1.0	2.0			
Right Crosswind (kt)	0	2.0	1.0			

Table II (concluded)

C-130E USAF S/N 64-0560
A/A32H-4 Rail System

Flight		48	49	50	56		57		58	
Date		18 May 66	19 May 66	23 May 66	1 Jun 66		2 Jun 66		3 Jun 66	
Airplane Gross Weight After Extraction (lb)		105 100	105 500	112 400	102 300		102 800		104 000	
Flap Position (pct)		50	50	50	70		70		70	
Extraction Load Wt (lb)		12 320	12 120	12 440	18 200		18 600		18 400	
Predrop cg (pct MAC)		19.9	26.1	22.6	25.2		23.4		18.8	
Postdrop cg (pct MAC)		25.1	17.8	18.4	14.6		14.8		23.1	
Indicated Airspeed (kt)		130.0	137.0	131.0	127.0		131.0		125.0	
Radar Alt at Extr (ft)		2.0	5	1	5		5		4	
Extraction Parachutes	No.	1	1	1	1	1	1	1	1	1
	Dia	32 ft	32 ft	32 ft	32 ft	15 ft	32 ft	15 ft	32 ft	15 ft
	Type	RS'	RS'	RS'	RS'	RS	RS'	RS	RS'	RS
Extraction Ratio		1.9		0.6	1.8		1.7		0.98	
Ambient Temp (deg C)		39.9	39.5	31.0	34.0		32.0		30.5	
Pressure Altitude (ft)		30	150	20	45		5		-60	
Headwind (kt)		1.0	1.0	1.0	6.0		11.0		5.0	
Right Crosswind (kt)		1.0	3.0	-3.0	-1.0		0		3.0	

Table III. Summary of RS' LAPES Test Conditions

C-130E USAF S/N 64-0560
A/A32H-4 Rail System

Flight	59	60	61	63	64	65
Date	6 Jun 66	7 Jun 66	8 Jun 66	9 Jun 66	10 Jun 66	20 Jun 66
Airplane Gross Weight After Extraction (lb)	104 300	104 000	103 500	104 200	104 800	104 300
Flap Position (pct)	70	70	70	70	50	50
Extraction Load Wt (lb)	11 950	11 950	13 000	24 600	24 900	17 800
Predrop cg (pct MAC)	18.7	19.7	18.1	19.7	23.7	22.3
Postdrop cg (pct MAC)	24.6	25.5	24.3	25.0	24.7	22.2
Indicated Airspeed (kt)	110.0	134.5	125.0	129.0	135.5	132.0
Radar Alt at Extr (ft)	0	7	5	7	5	5040*
Extraction Parachutes No.	1 / 1	1 / 1	1 / 1	2 / 1	2 / 1	1
Extraction Parachutes DIA	32 ft / 15 ft	32 ft / 15 ft	32 ft / 15 ft	32 ft / 15 ft	32 ft / 15 ft	28 ft
Extraction Parachutes Type	RS' / RS	RS' / RS	RS' / RS	RS' / RS	RS' / RS	RS
Extraction Ratio	1.6	2.3	1.1	0.91	0.98	1.0
Ambient Temp (deg C)	33.0	27.5	27.5	32.0	32.0	27.0
Pressure Altitude (ft)	80	-5	105	120	5	5040
Headwind (kt)	8.0	14.0	8.0	-2.0	0	---
Right Crosswind (kt)	0	-5.0	0	2.0	0	---

*Askania altitude

Table III (continued)

C-130E USAF S/N 64-0560
A/A32H-4 Rail System

Flight		66	67		68		69		70	71	
Date		21 Jun 66	22 Jun 66		24 Jun 66		28 Jun 66		29 Jun 66	30 Jun 66	
Airplane Gross Weight After Extraction (lb)		103 700	103 700		104 200		101 000		103 700	103 700	
Flap Position (pct)		50	50		70		70		70	70	
Extraction Load Wt (lb)		18 000	18 000		13 000		25 400		24 900	25 000	
Predrop cg (pct MAC)		23.0	23.7		26.4		25.5		23.3	23.7	
Postdrop cg (pct MAC)		23.8	24.6		25.0		24.7		23.7	24.7	
Indicated Airspeed (kt)		132.0	134.0		133.5		130.5		128.0	132.0	
Radar Alt at Extr (ft)		5090**	4960**		7		5025**		5040**	5060**	
Extraction Parachutes	No.	1	1	1	1	1	1	1	1	1	1
	Dia	24 ft	15 ft	32 ft*	15 ft	32 ft*	22 ft	28 ft	28 ft	15 ft	32 ft*
	Type	RS	RS	RS'	RS	RS	RS	RS	RS	RS	RS'
Extraction Ratio		0.62	0.26		0.37		0.95		0.69	0.24	
Ambient Temp (deg C)		29.0	27.0		31.0		32.5		29.5	27.0	
Pressure Altitude (ft)		5090	4960		240		5025		5040	5060	
Headwind (kt)		---	---		-2.5		---		---	---	
Right Crosswind (kt)		---	---		-4.0		---		---	---	

*0-reef
**Askania altitude

Table III (continued)

C-130E USAF S/N 64-0550
A/A32H-4 Rail System

Flight		72		73		74		75		76		77	
Date		1 Jul 66		5 Jul 66		6 Jul 66		7 Jul 66		8 Jul 66		11 Jul 66	
Airplane Gross Weight After Extraction (lb)		103 900		102 200		104 500		102 800		102 200		108 500	
Flap Position (pct)		70		70		70		50		70		70	
Extraction Load Wt (lb)		24 800		24 800		25 500		18 700		24 800		25 000	
Predrop cg (pct MAC)		25.3		23.4		23.8		23.2		28.0		22.8	
Postdrop cg (pct MAC)		25.6		25.6		25.0		23.8		23.2		15.3	
Indicated Airspeed (kt)		122.0		112.0		125.0		121.0		127.0		126.5	
Radar Alt at Extr (ft)		2		35		3		3		4		2	
Extraction Parachutes	No.	1	1	2	1	2	1	1	1	2	1	2	1
	Dia	15 ft	32 ft*	32 ft	15 ft	32 ft	15 ft	32 ft	15 ft	32 ft	15 ft	32 ft	15 ft
	Type	RS	RS*	RS*	RS	RS*	RS	RS*	RS	RS*	RS	RS*	RS
Extraction Ratio		0.26		1.6		1.5		1.4		0.85		1.4	
Ambient Temp (deg C)		34.0		42.0		45.0		39.5		36.0		41.5	
Pressure Altitude (ft)		130		95		180		95		65		85	
Headwind (kt)		-4.0		-1.0		5.0		-6.0		-4.0		-3.0	
Right Crosswind (kt)		0		-0.5		-2.0		-5.0		2.0		-2.0	

*0-reef

Table III (continued)

C-130E USAF S/N 64-0560
A/A32H-4 Rail System

Flight		78	79	80	81		
Date		12 Jul 66	13 Jul 66	14 Jul 66	15 Jul 66		
Airplane Gross Weight After Extraction (lb)		106 300	103 900	107 600	103 500		
Flap Position (pct)		70	70	70	70		
Extraction Load Wt (lb)		25 000	24 700	18 300	18 000		
Predrop cg (pct MAC)		26.5	24.8	25.3	24.8		
Postdrop cg (pct MAC)		17.7	26.1	25.2	24.7		
Indicated Airspeed (kt)		119.5	124.0	130.0	129.0		
Radar Alt at Extr (ft)		0	8		6		
Extraction Parachutes	No.	2 1	1 1	1	1		
	Dia	32 ft 15 ft	32 ft 15 ft	15 ft**	15 ft**		
	Type	RS RS	RS RS	RS	RS		
Extraction Ratio		0.78	0.23	0.10	0.11		
Ambient Temp (deg C)		36.5	34.0	29.5	35.5		
Pressure Altitude (ft)		65	105	5080	70		
Headwind (kt)		2.0	0	---	3.0		
Right Crosswind (kt)		-4.0	7.0	---	5.0		

*0-reef

**148-in. reef

***Askania altitude

Table III (concluded)

C-130E USAF S/N 64-0560
A/A32H-4 Rail System

NOTES: 1. All LAPES tests are normal extractions.
2. Solid symbols denote tests on which the airplane contacted the ground during the extraction.

Symbol	Condition
○	LAPES
△	GPES

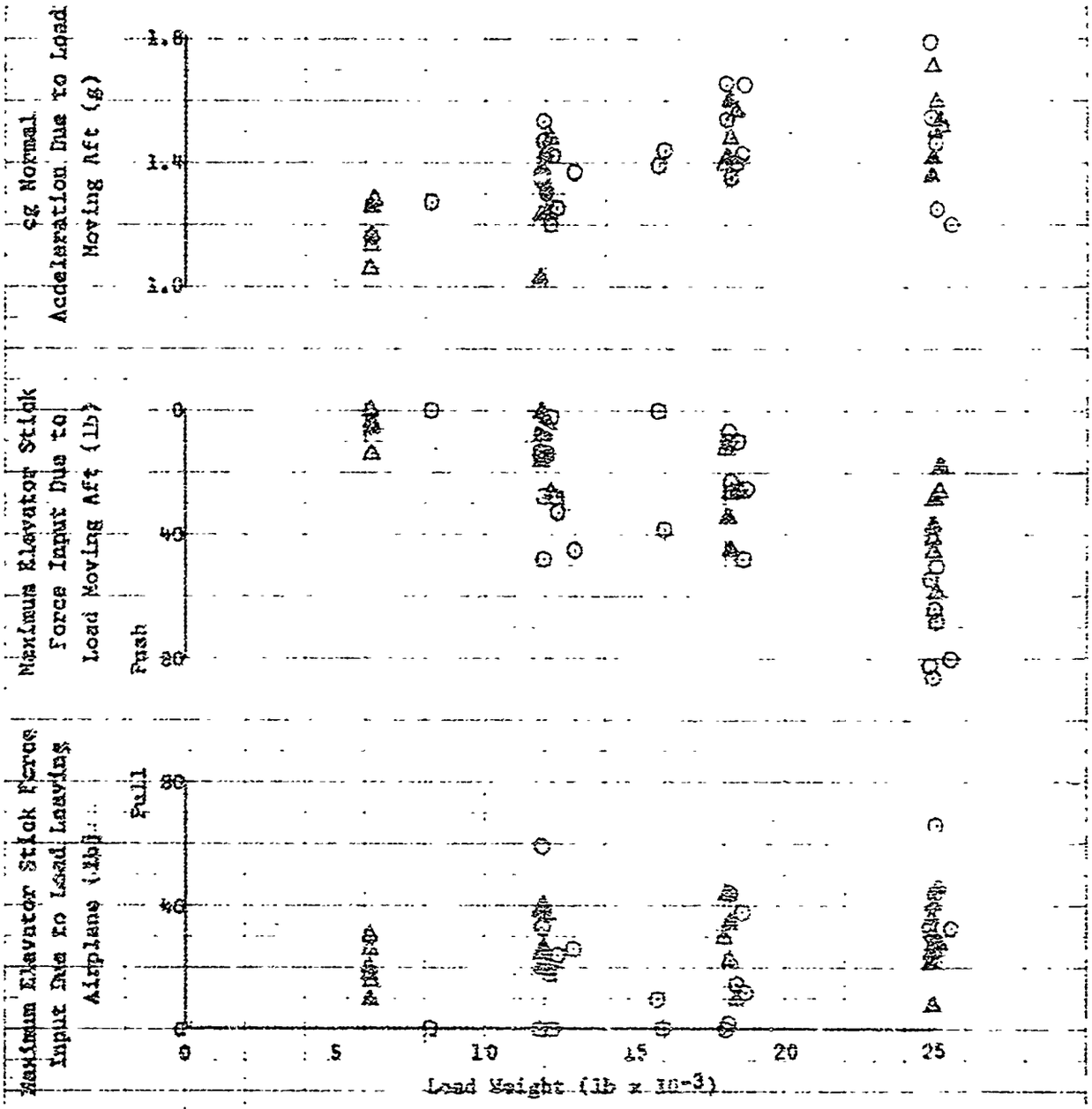


Figure 4 Summary of Airplane Reactions to LAPES and GPES

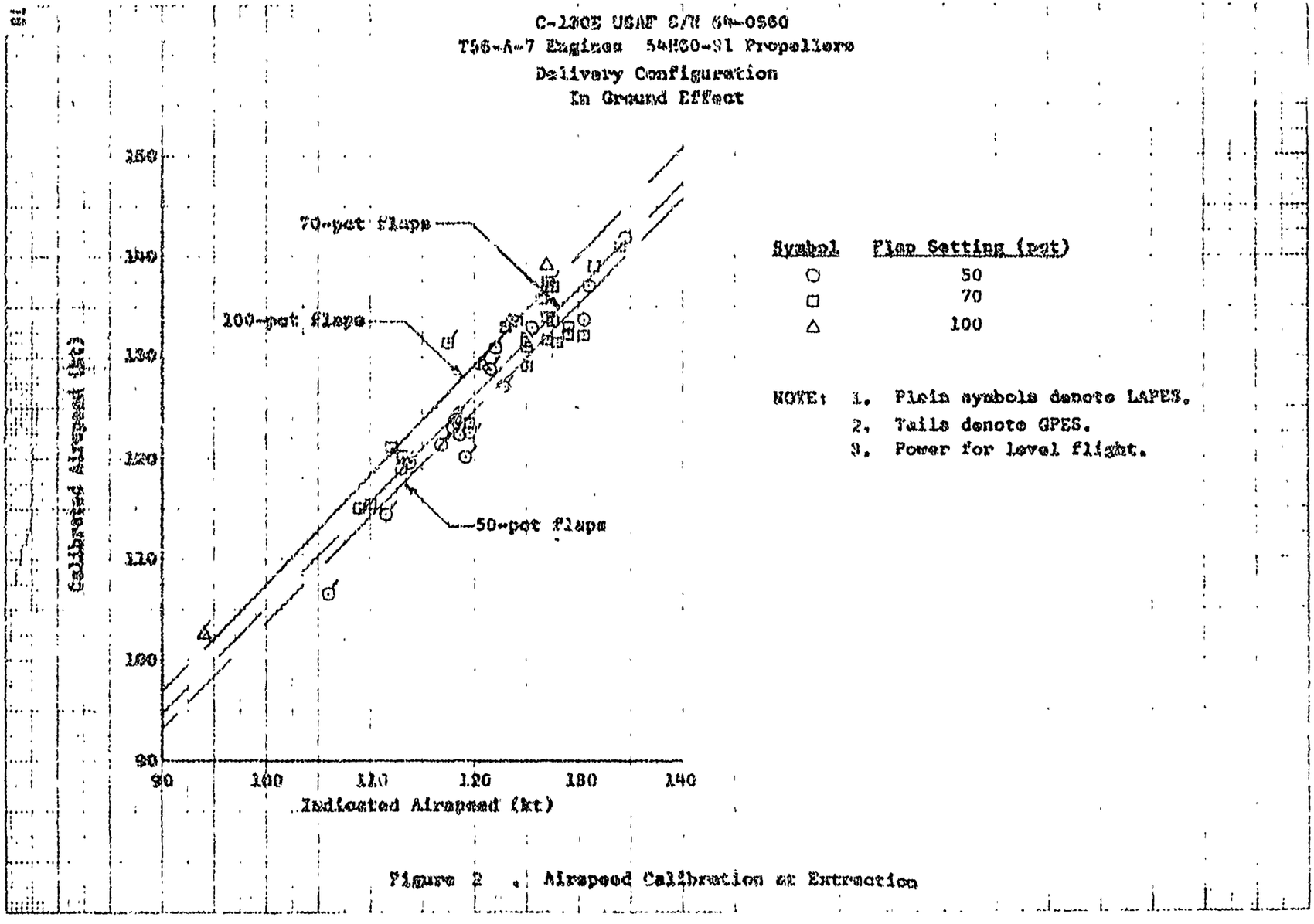


Figure 2 . Airspeed Calibration at Extraction

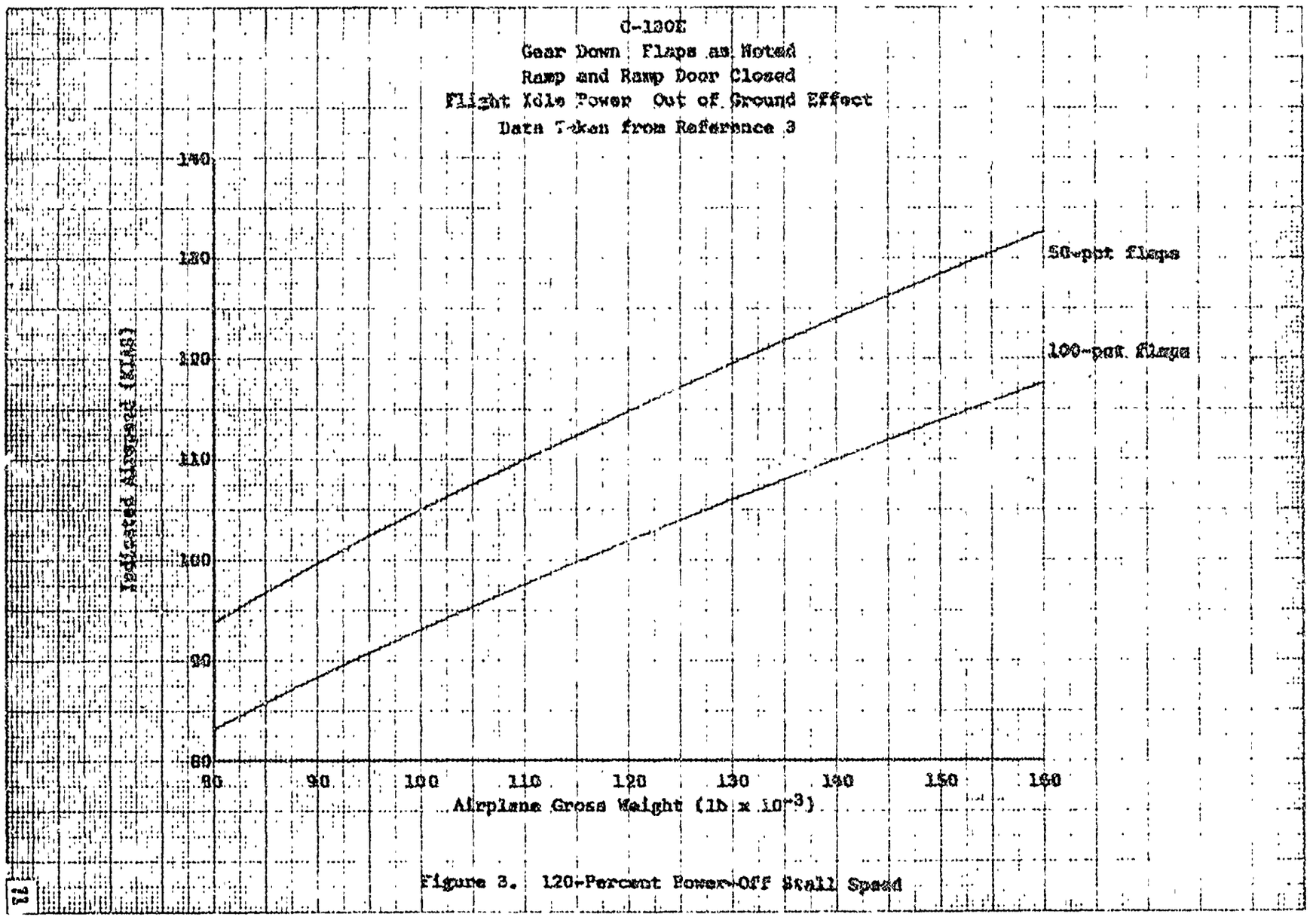


Figure 3. 120-Percent Power-Off Stall Speed

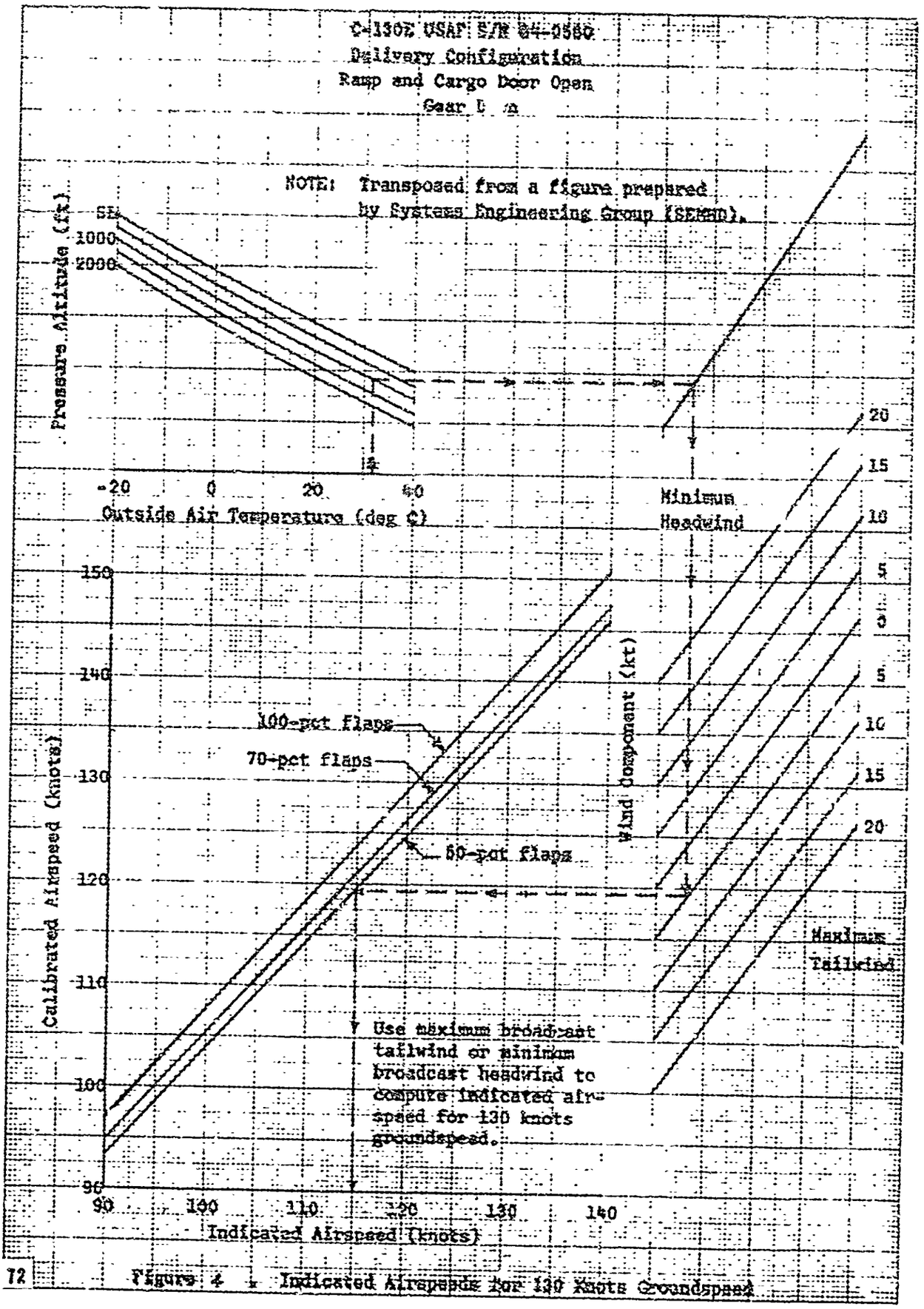


Figure 4 . Indicated Airspeeds for 130 Knots Groundspeed

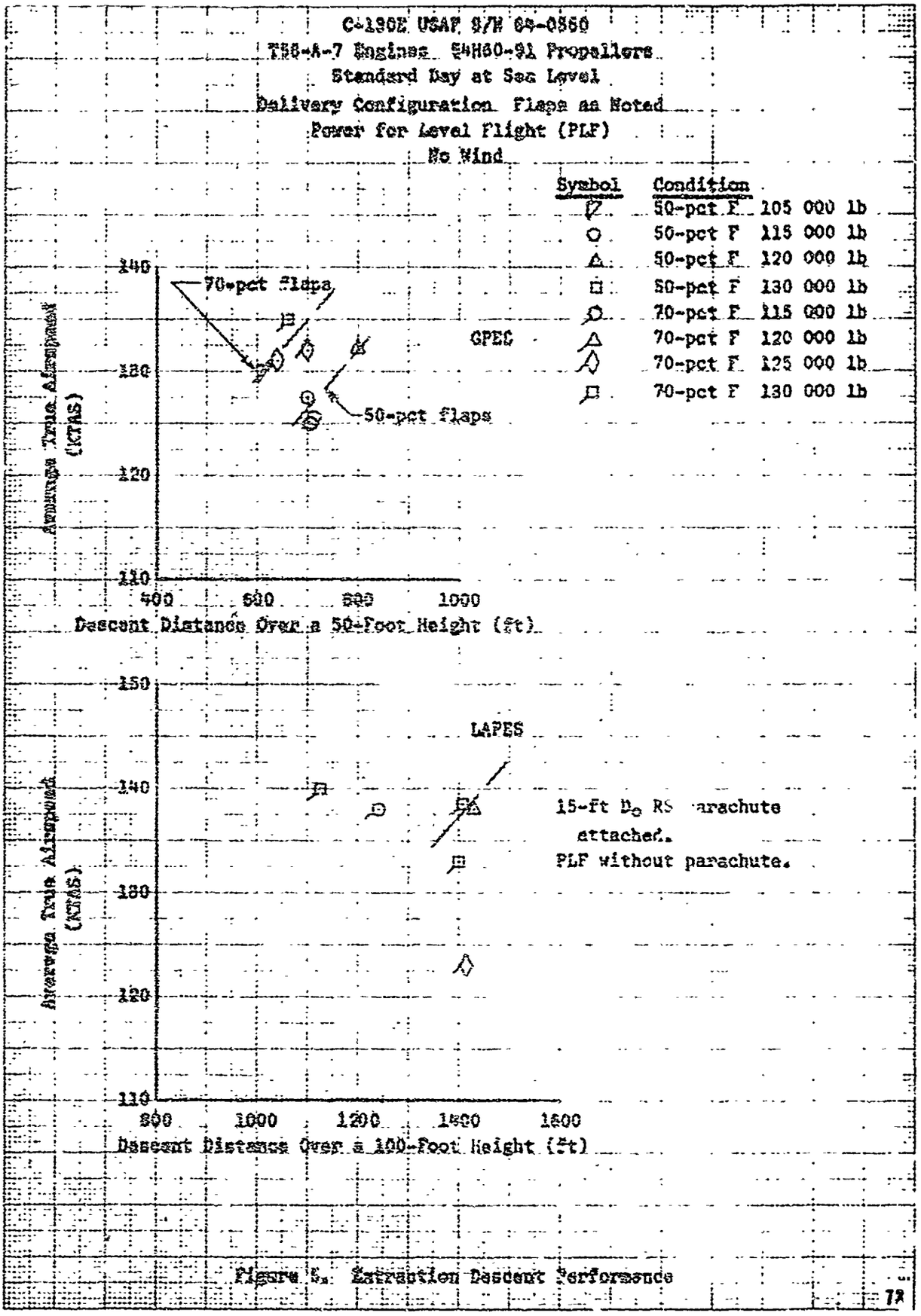
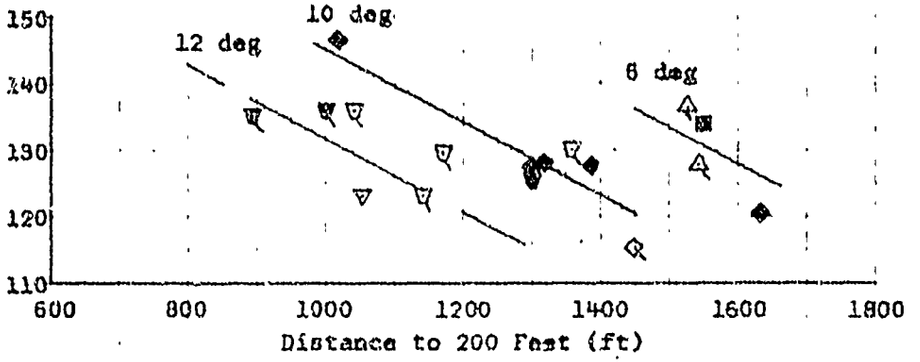


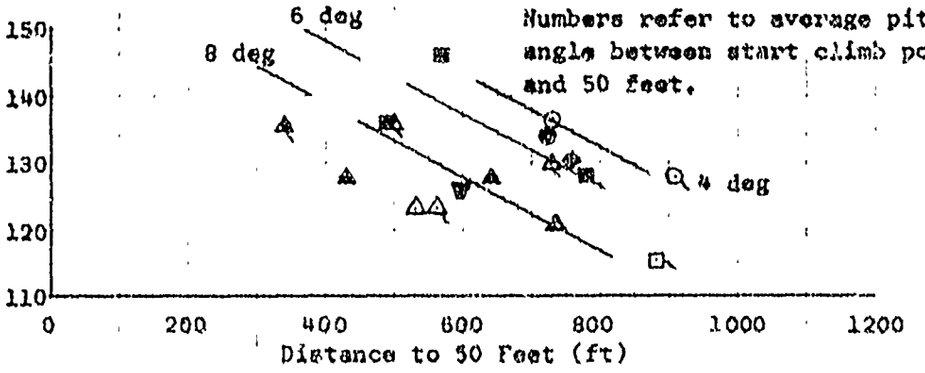
Figure 5. Extraction Descent Performance

C-130E USAF S/N 64-0560
T56-A-7 Engines 54H60-91 Propellers
Standard Day at Sea Level
Military Rated Power (3880 static shp/eng).
Delivery Configuration Flap Setting as Noted
Gross Weight 100,000 lb
No Wind

Numbers refer to average pitch angle between start climb point and 200 feet.



Numbers refer to average pitch angle between start climb point and 50 feet.



Symbol	Condition Avg Pitch Angle (deg)
○	3 - 5
□	5 - 7
△	7 - 9
◇	9 - 11
▽	11 - 13

NOTE:
1. Solid symbols denote tests with headwind component less than ±10 ft/sec (±5.9 kt).
2. A time interval of 0.75 sec should be added to the plotted distances. $\Delta Dist = 0.75 \times 1.688 \times V_T$. The start climb point was taken when the power started increasing. There is a 0.75 sec lag between power lever movement (actual start climb point) and power increase.
3. Plain symbols denote 50-percent flaps. Tailed symbols denote 70-percent flaps.

Figure 6 . Climbout Distance

C-130E USAF S/N 64-0560
T56-A-7 Engines 54H60-91 Propellers

Symbol	Altitude (ft) x 10^{-3}	Gross Weight (lb) x 10^{-3}	Flight No.	Average T_a (deg K)
○	14.5	90	13-B	267.0 (level flight)
□	2.0	130	80	307.5 (sawtooth climb)

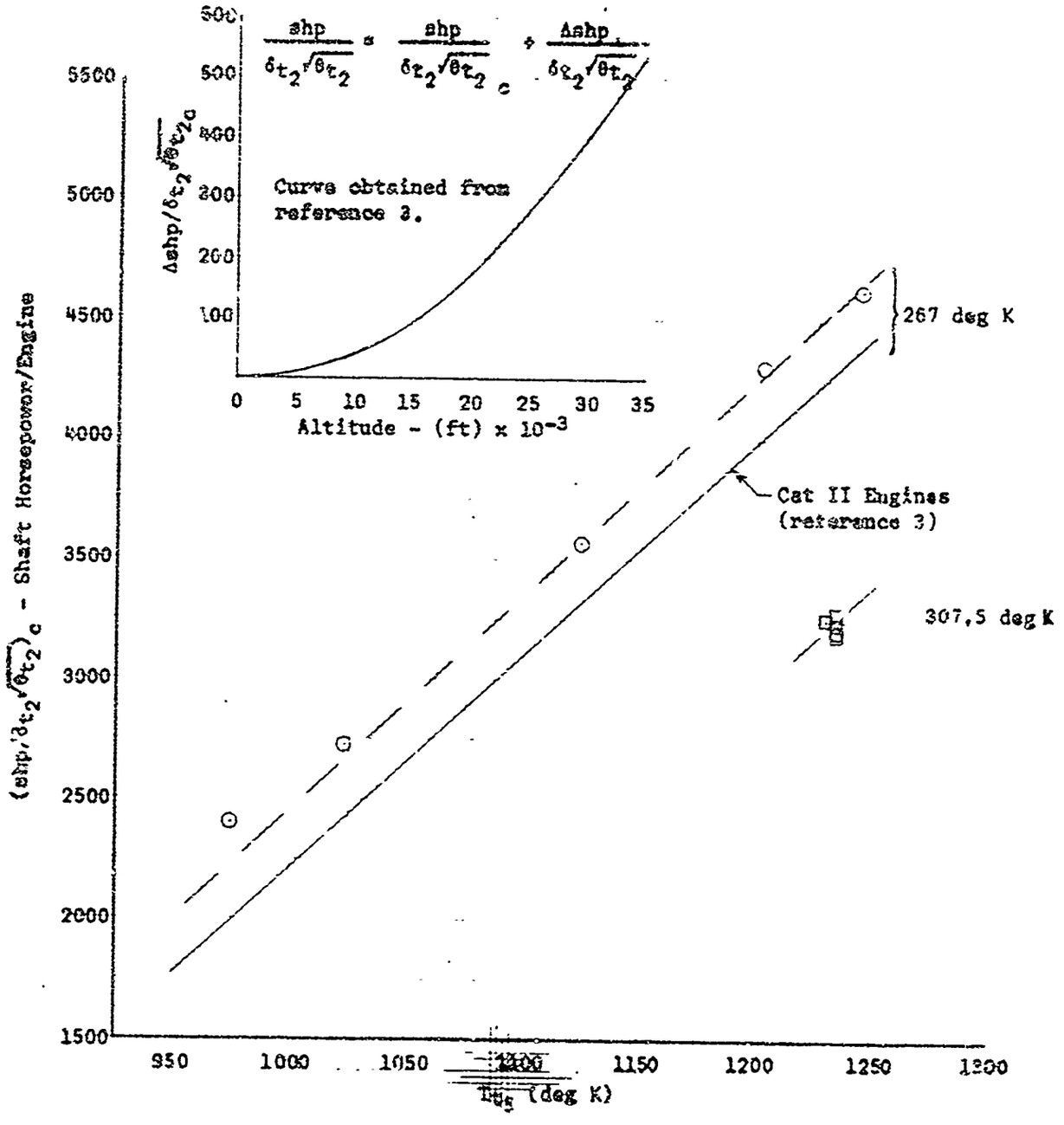


Figure 7 . Engine Performance

C-130E (MP) T/M 64-0550
T56-A-7 Engines 54H60-91 Propellers
Military Rated Power (971 deg C TIT)
Standard Day at 2000 Ft
Four Engines Operating
130 000 lb Gross Weight

Delivery Configuration
(Gear Down, Ramp and Ramp Door Open and
70-percent Wing Flaps)

One 15-Foot Ring Slot Drogue
Parachute Attached by a 60-Foot
Line to a Pin on the Ramp Floor

NOTE: 1. Rates of climb are presented for a constant calibrated airspeed.
2. Tails on symbols denote reciprocal headings.
3. Data points are corrected to the power output of the engines used in the AFFTC C-130E Category II Performance tests.

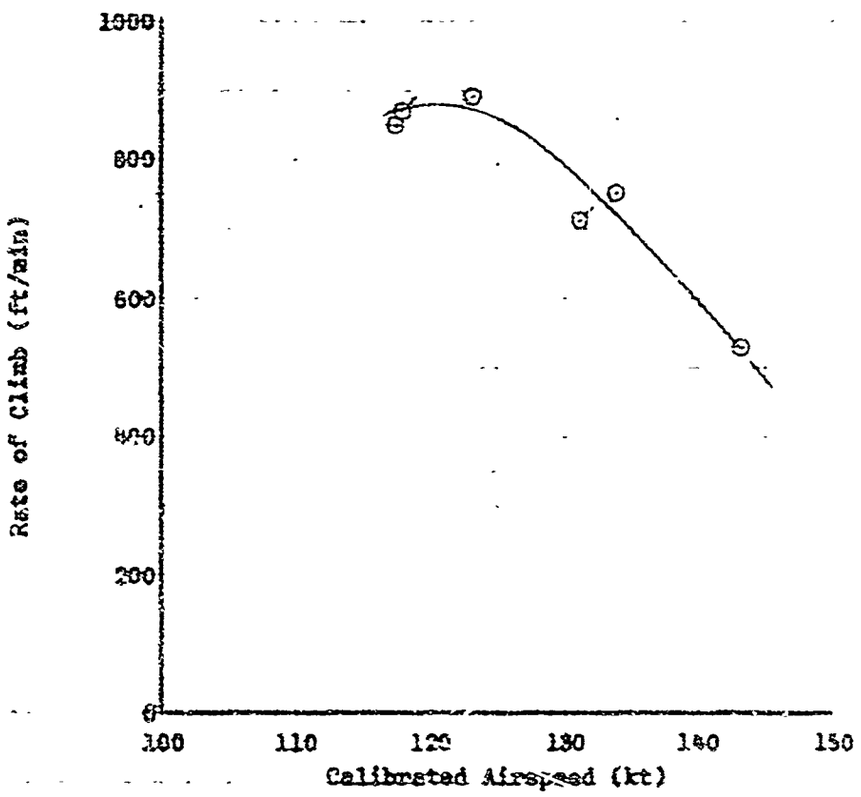


Figure 8. Sawtooth Climb

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C-130E USAF S/N 64-0550
A/A32H-4 Fail System
Extraction Number 47

Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (pct MAC)	Airplane cg After Extraction (pct MAC)	Load Weight (lb)	Flap Position (pct)	Elevator Trim Tab Position (deg)
104 300	19.9	24.3	24 850	70	10 ANU

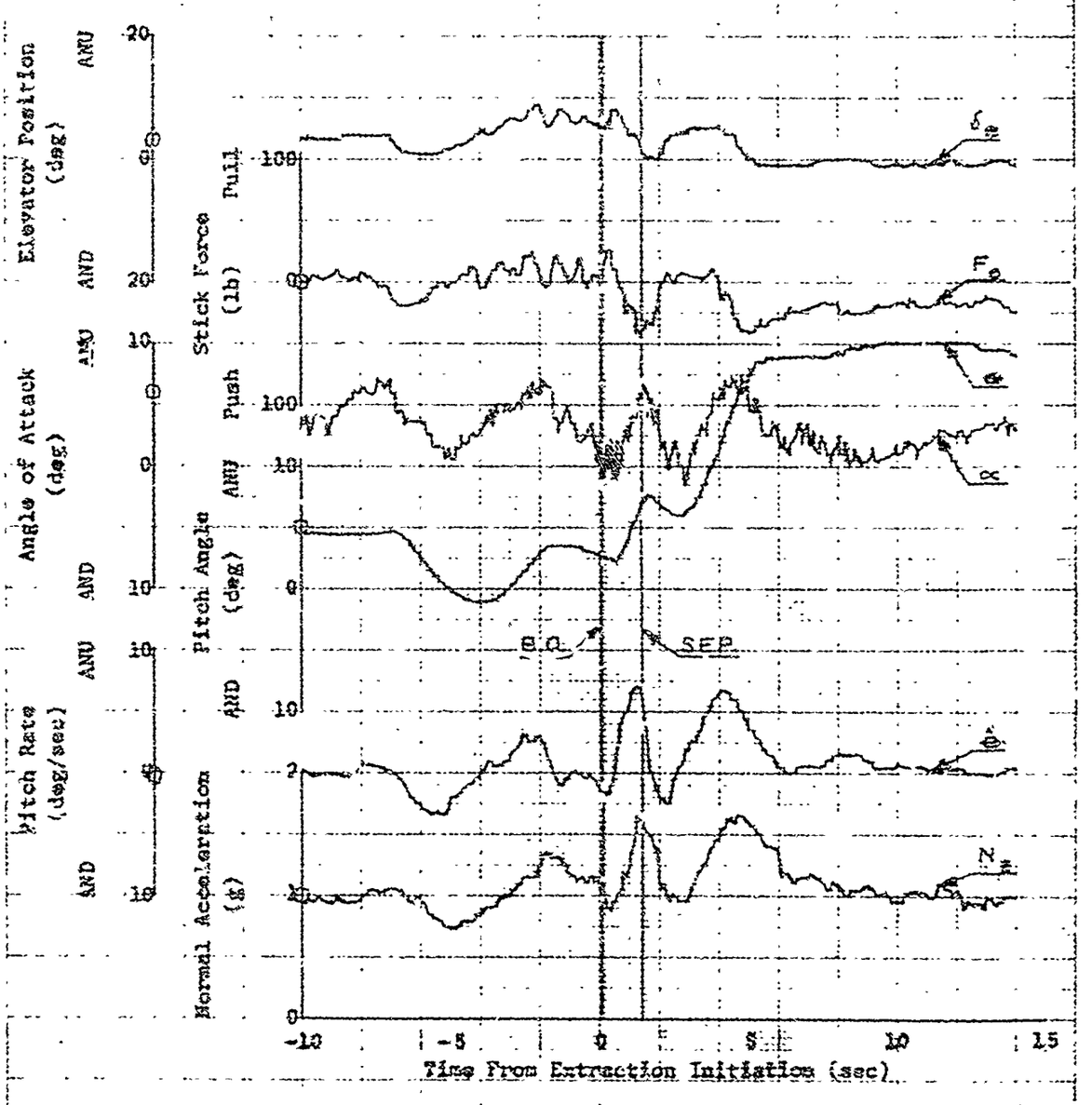


Figure 9 . GPES Time History

NOTE: 1. Symbols denote trim value.
2. Time zero is point of hook engagement.
3. Turbulence was light.

Pressure Altitude (ft)	Outside Air Temp (deg)	Headwind Component + headwind (knots)	Crosswind Component + from right (knots)
0	30.0 C	2	1

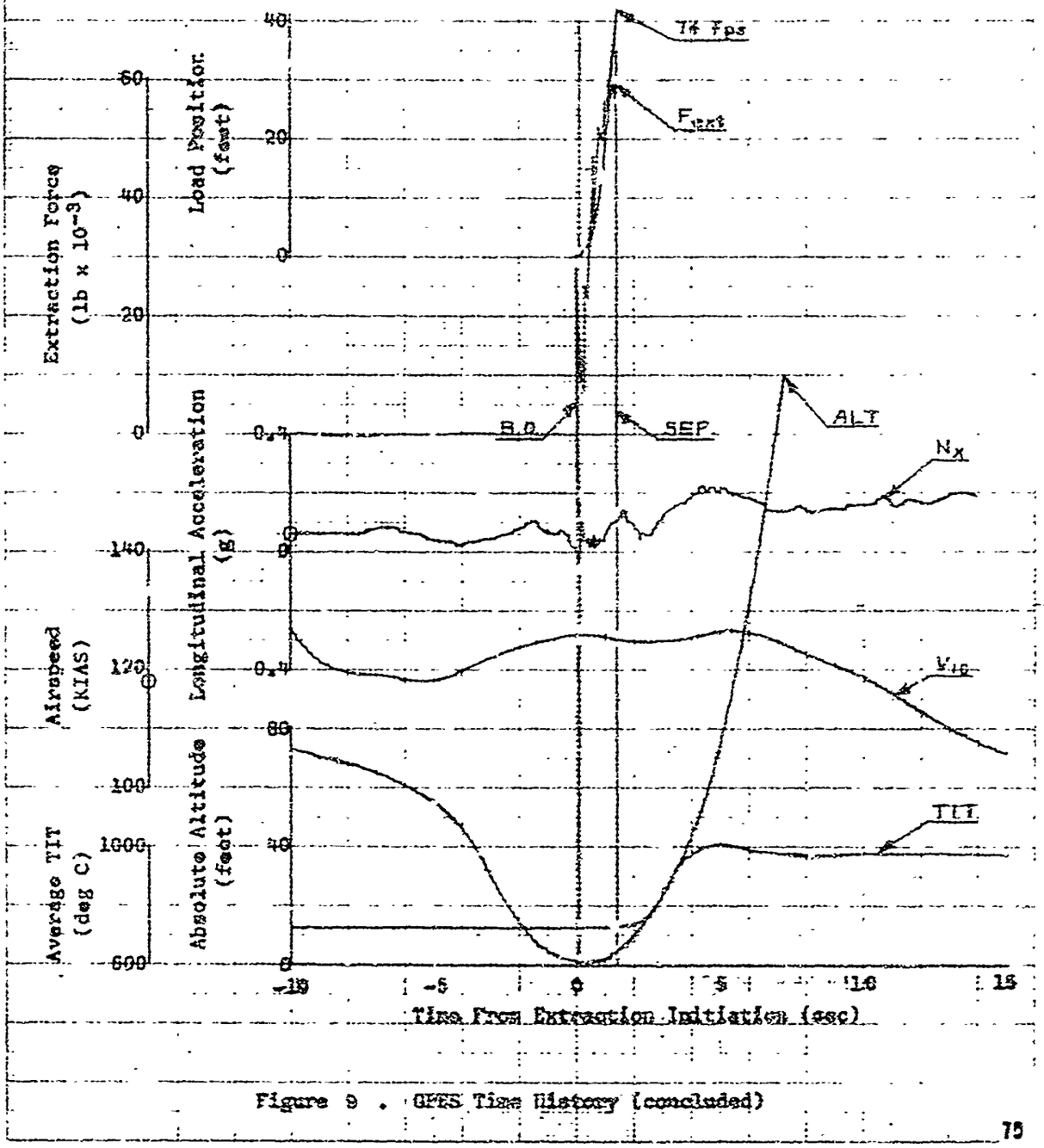


Figure 9 . CPES Time History (concluded)

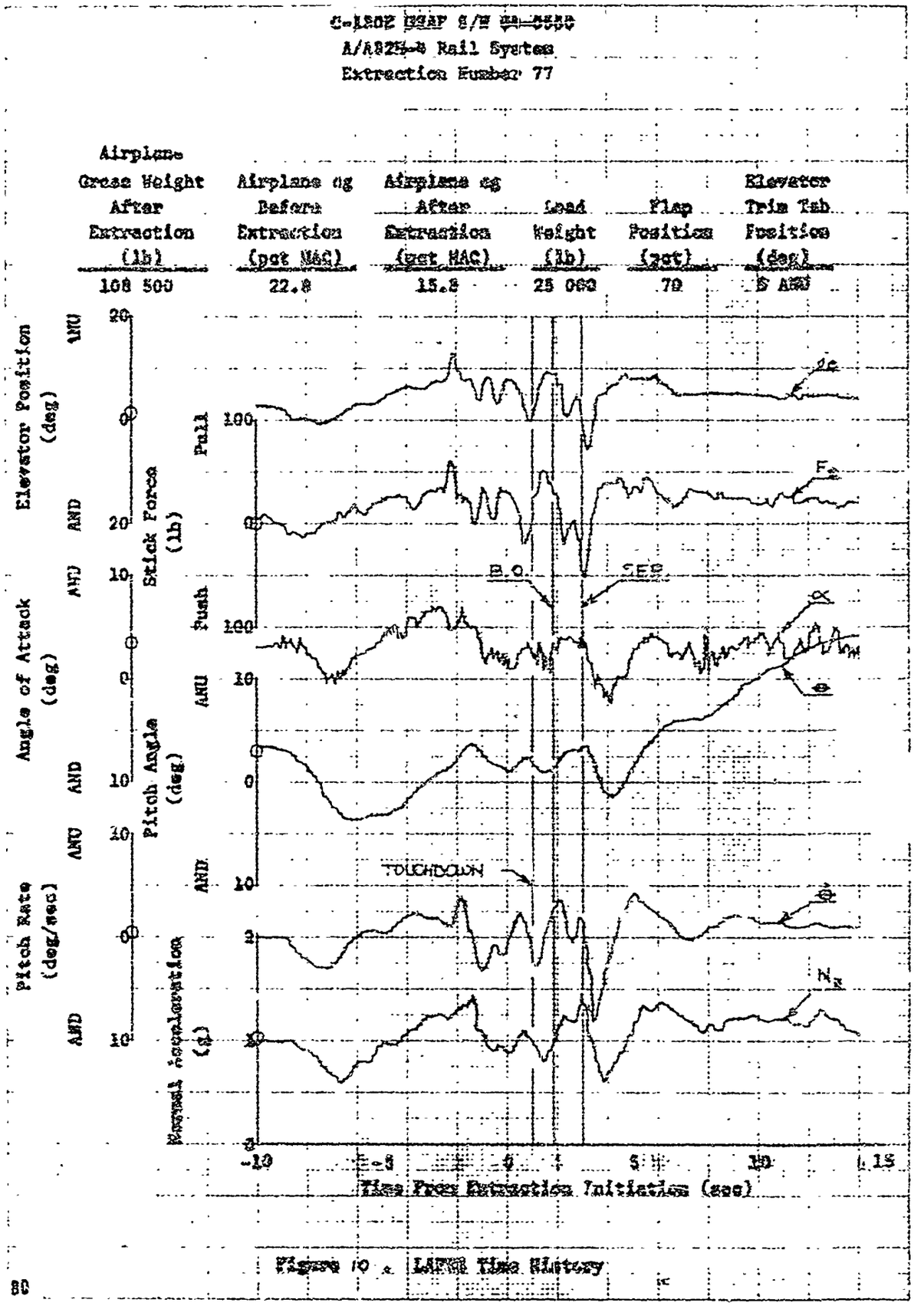


Figure 10 . [illegible] Time History

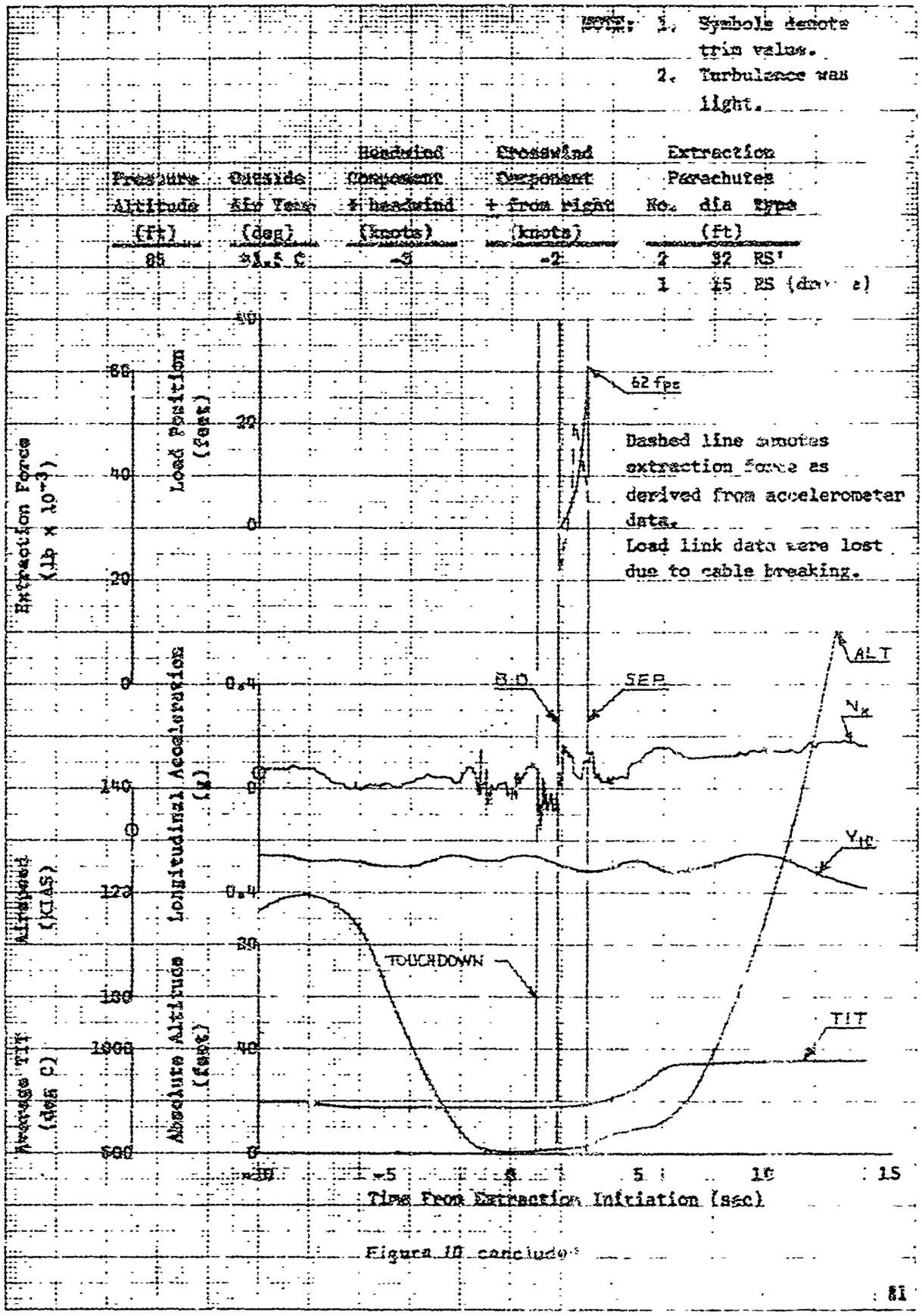


Figure 10 concluded

C-130E USAF S/N 64-0563

A/A42H-4 Rail System

Extraction Number 1

Airplane Gross Weight After Extraction (lb)	Airplane cg (pct MAC)	Load Weight (lb)	Extraction Parachutes no.	dia (ft)	type	Flap Position (pct)	Elevator Trim Tab Position (deg)
	25.1 before drop	9200	1	28	RS	50	2.0 AMU
105 600	25.2 after drop						

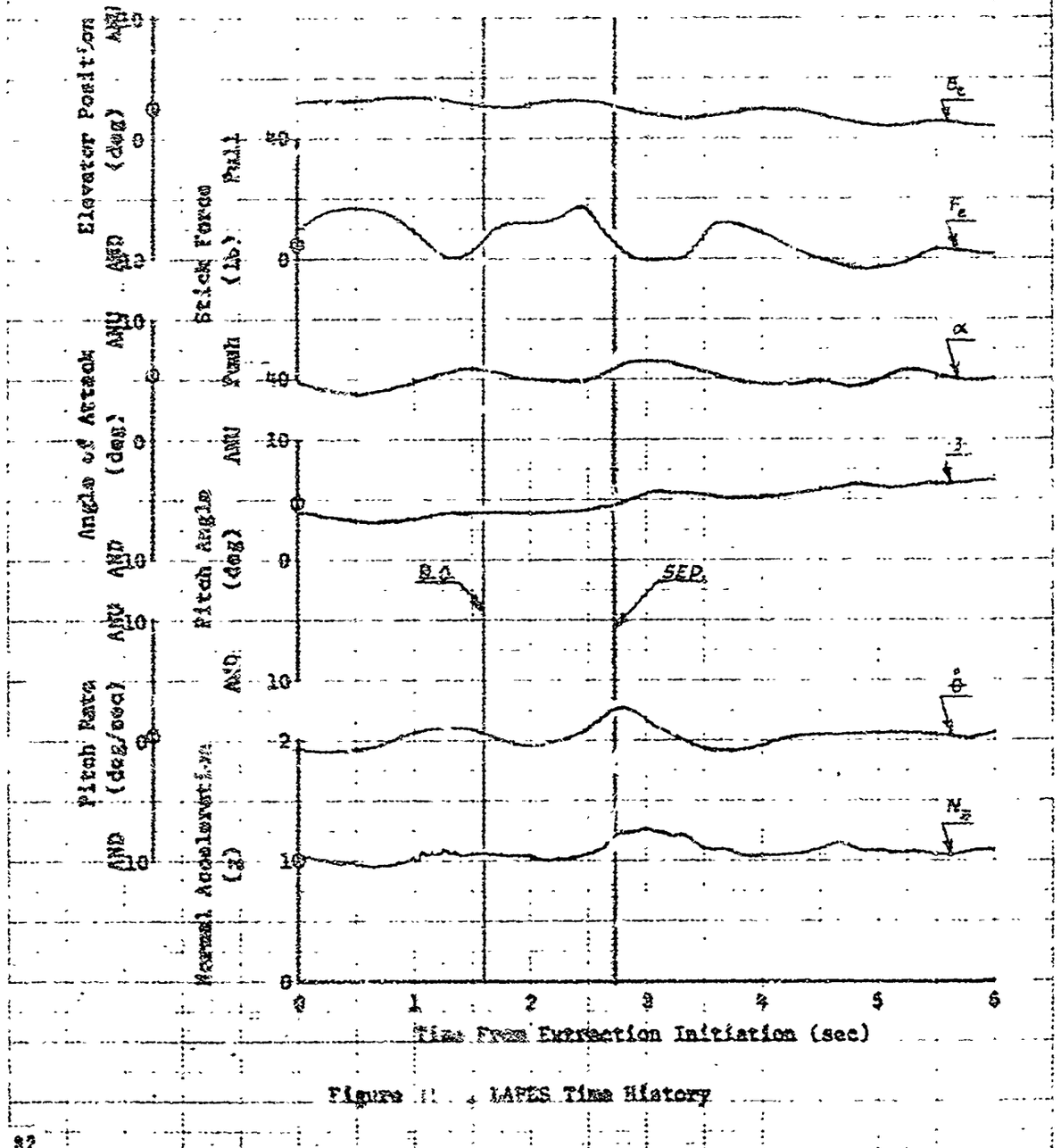


Figure [illegible]. LAPES Time History

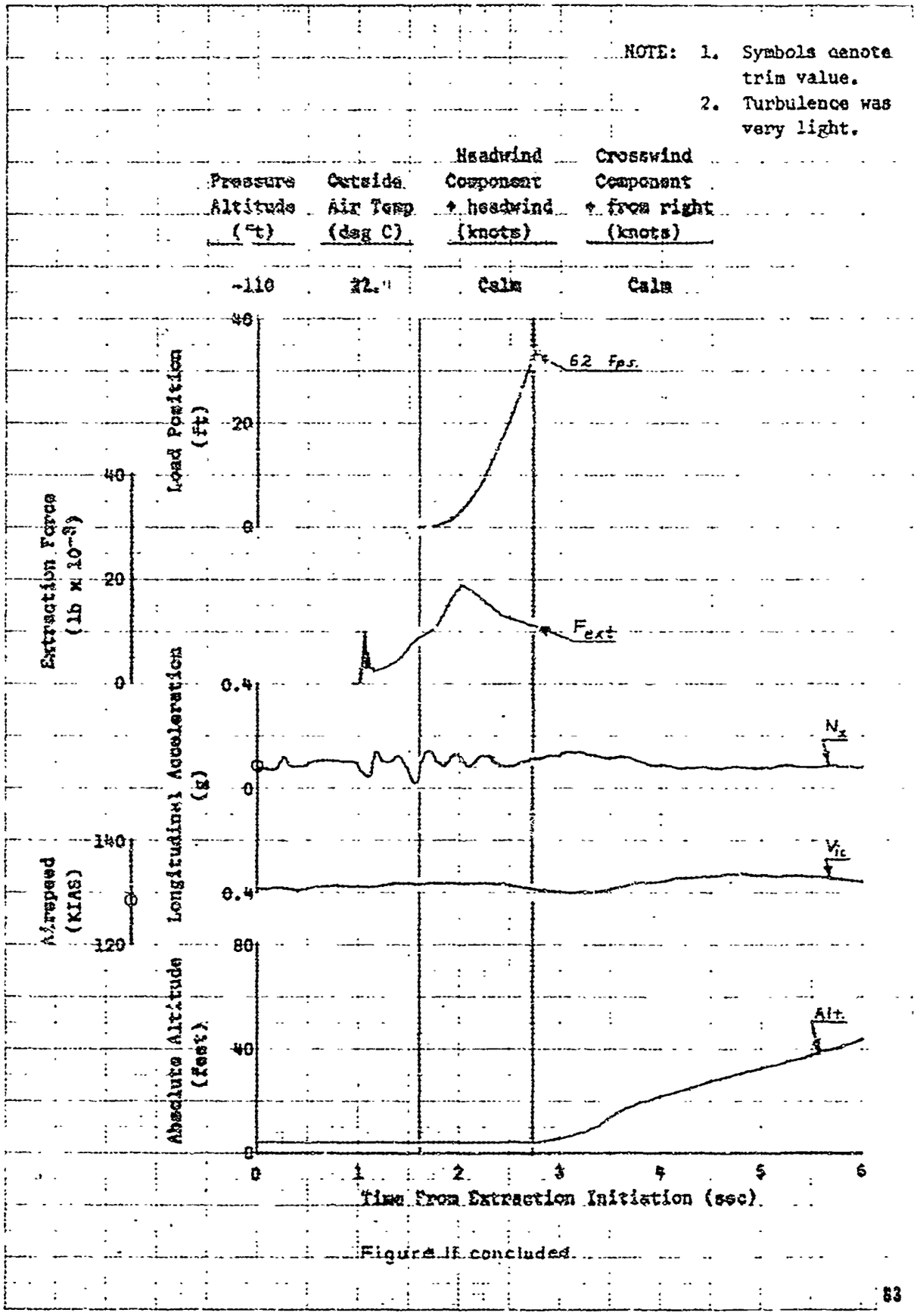


Figure 4 concluded.

C-130E USAF S/N 64-0560
A/A32P-4 Rail System
Extraction Number 4

Airplane Gross Weight After Extraction (lb)	Airplane cg (pct MAC)	Load Weight (lb)	Extraction Parachutes no.	dia (ft)	type	Flap Positions (pct)	Elevator Trim Tab Position (deg)
102 700	25.1 before drop 24.6 after drop	11 900	1	26	RS	50	2.0 ANU

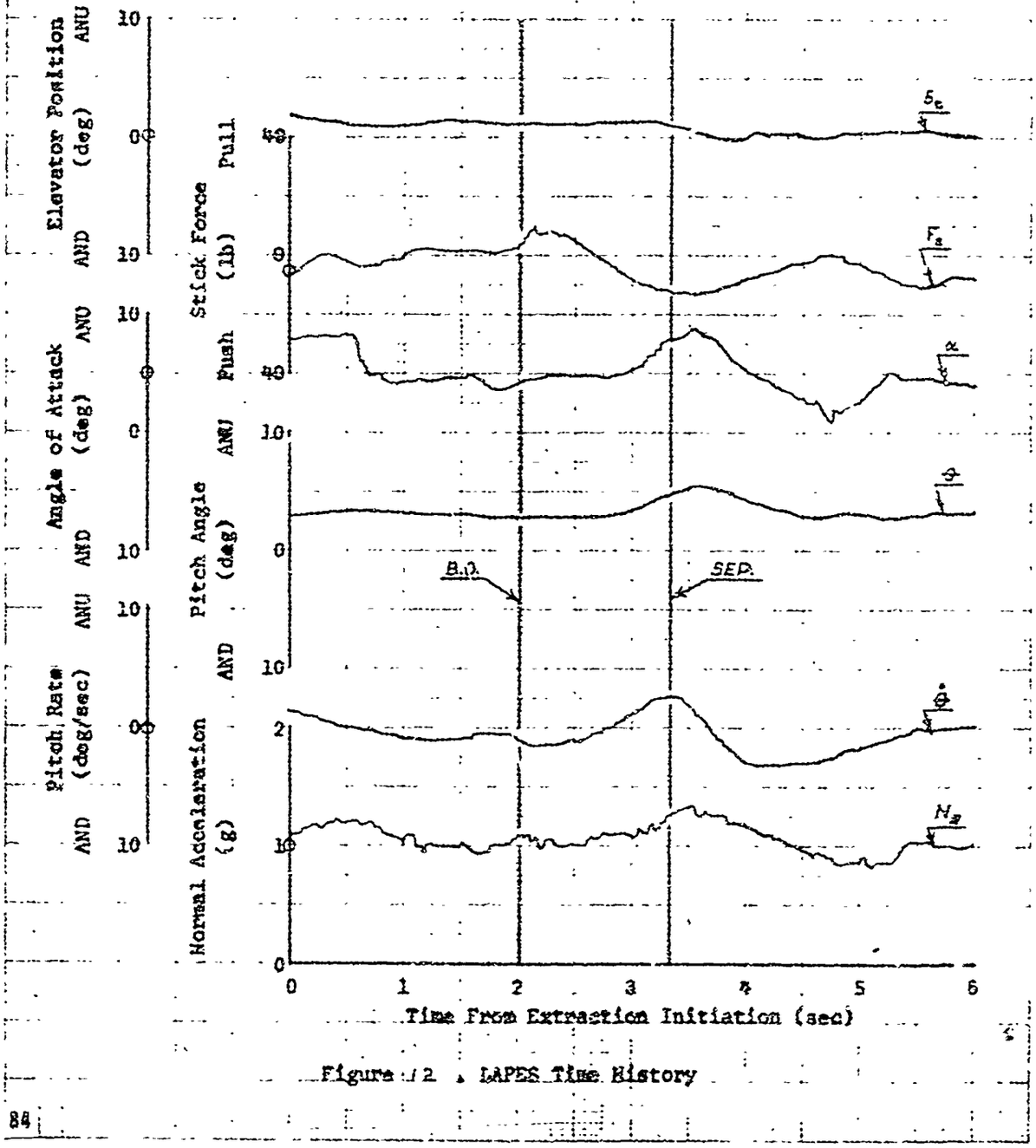


Figure 12. LAPES Time History

NOTE: 1. Symbols denote trim value.

2. Turbulence was moderate.

Pressure Altitude (ft)	Outside Air Temp (deg C)	Headwind Component + headwind (knots)	Crosswind Component + from right (knots)
130	17.0	24.0	0

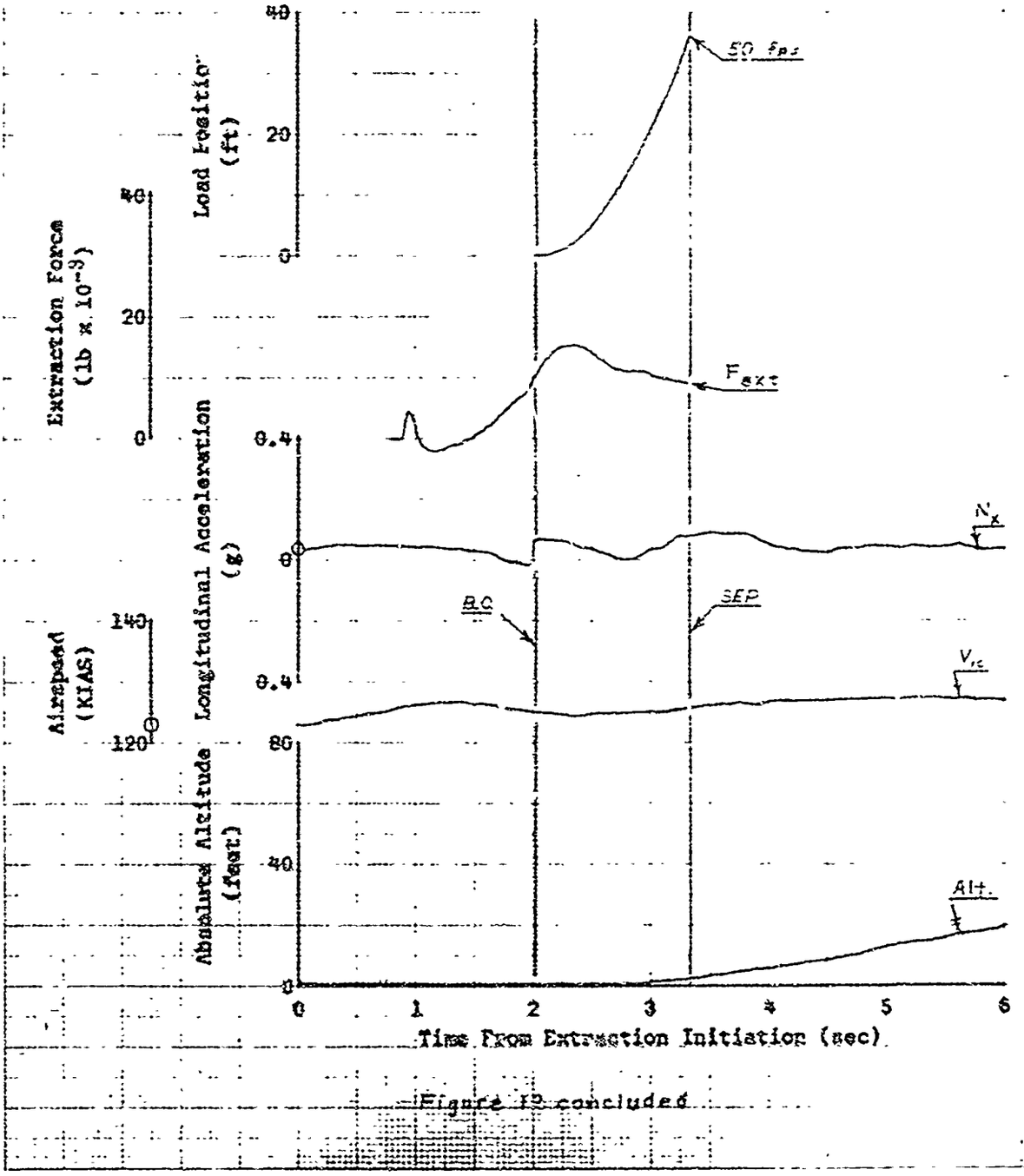


Figure 13 concluded

C-130E USAF S/N 64-0560

A/A32H-4 Rail System

Extraction Number 3

Airplane Gross Weight After Extraction (lb)	Airplane cg (pct MAC)	Load Height (lb)	Extraction Parachutes no.	dia (ft)	type	Flap Position (pct)	Elevator Trim Tab Position (deg)
	25.3 before drop	12 200	2	28	RS	50	2.0ANU
102 600	25.0 after drop						

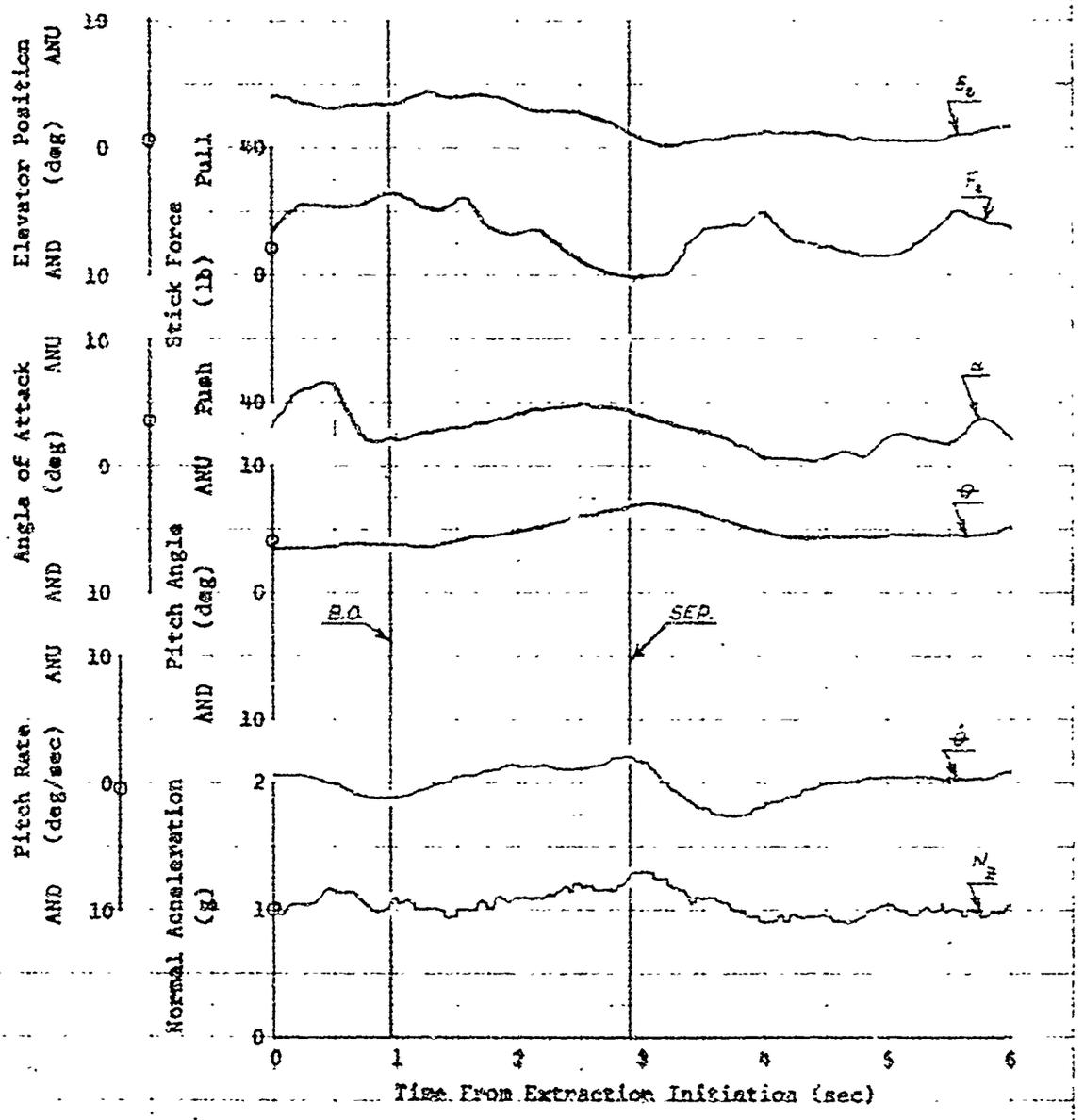


Figure 13 - LAPES Time History

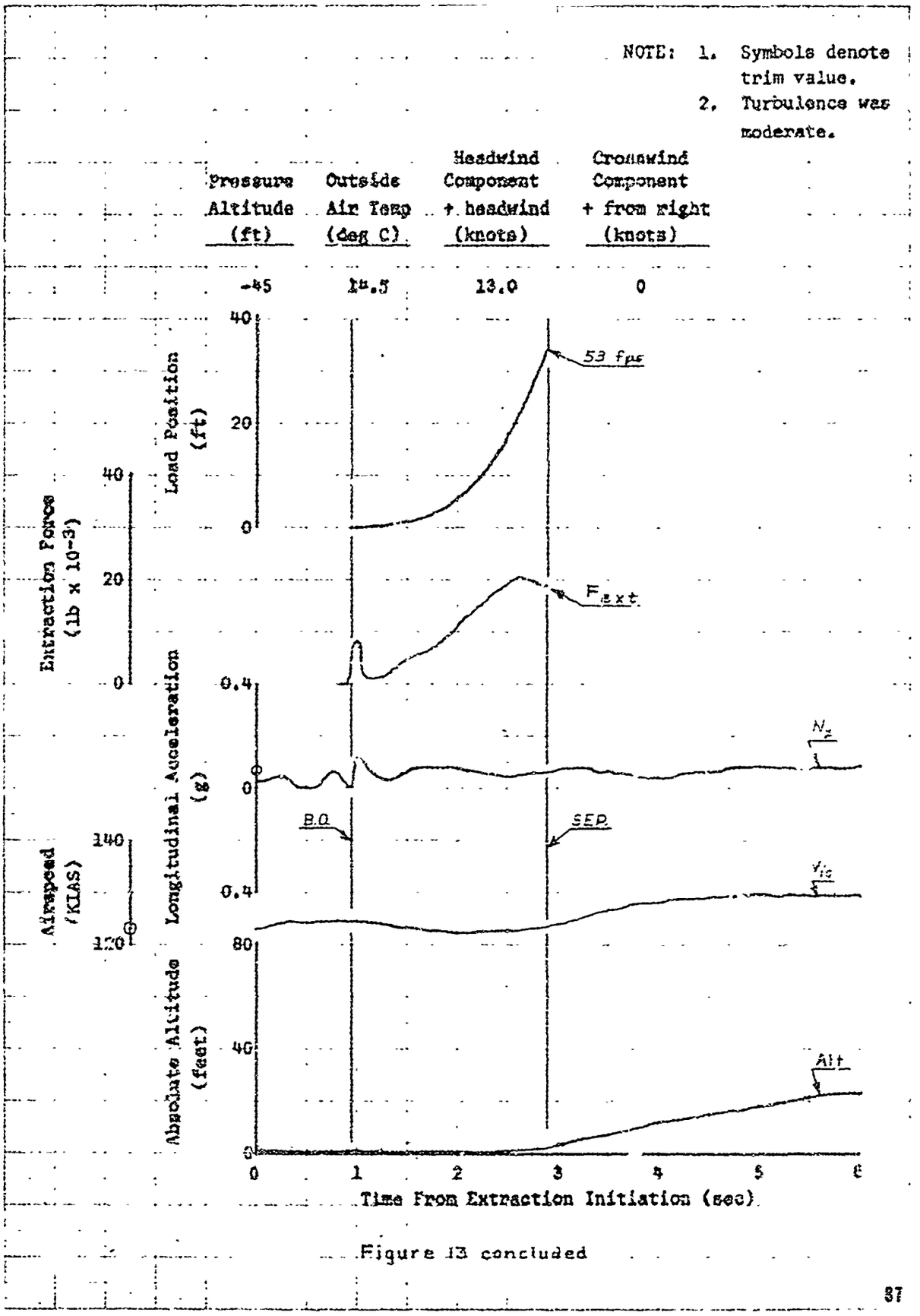


Figure 13 concluded

C-130E USAF S/N 84-0352
A/A32E-4 Rail System
Extraction Number 4

Airplane Gross Weight After Extraction (lb)	Airplane cg (pct MAC)	Load Weight (lb)	Extraction Parachutes no.	dia (ft)	type	Flap Position (pct)	Elevator Trim Tab Position (deg)
105 000	24.7 before drop 24.4 after drop	16 100	1	28	RS	50	2.0ANU

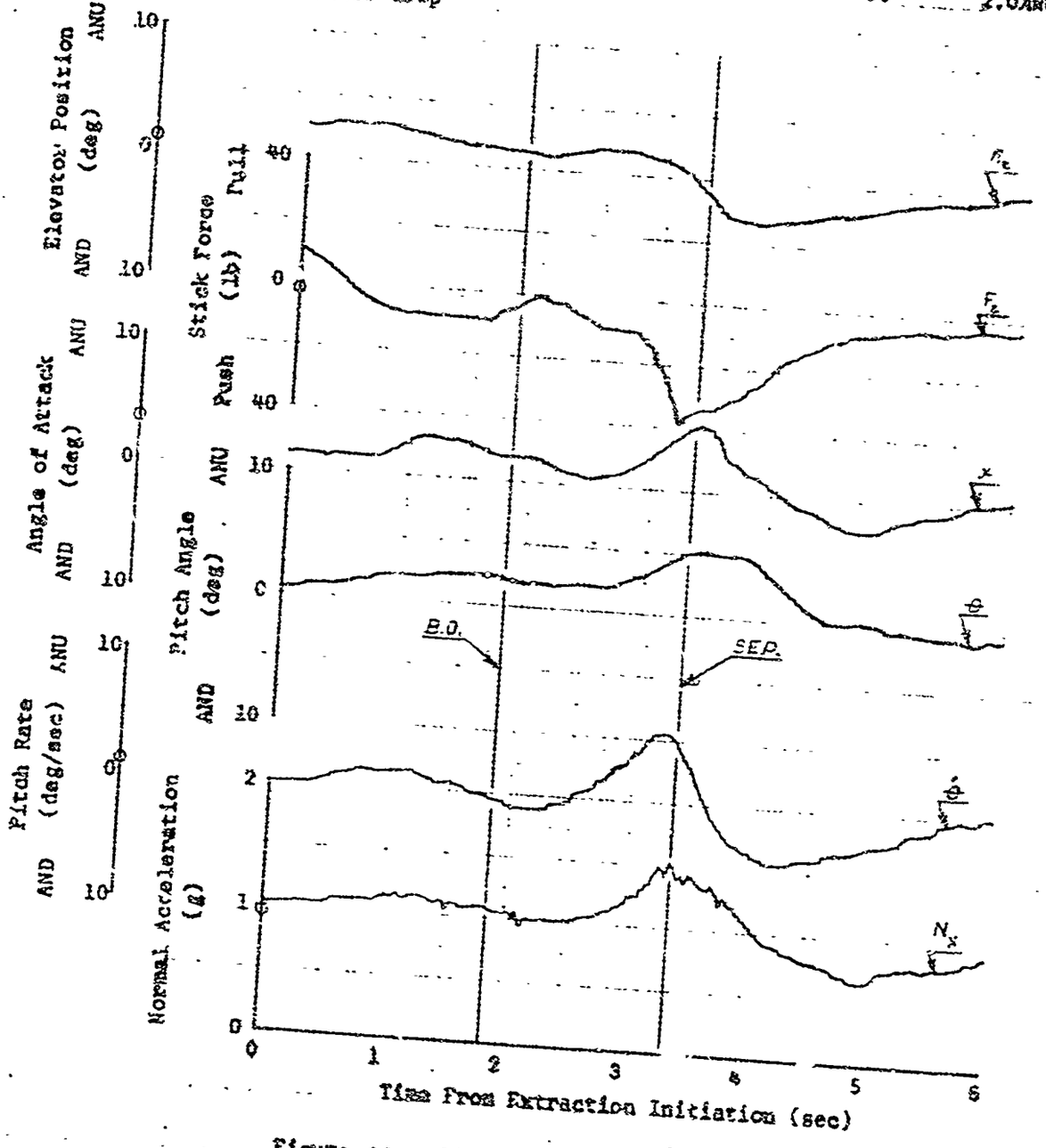


Figure 14 . LAPES Time History

NOTE: 1. Symbols denote trim value.
2. Turbulence was light.

Pressure Altitude (ft)	Outside Air Temp (deg C)	Headwind Component + headwind (knots)	Crosswind Component + from right (knots)
-245	14.6	Calm	Calm

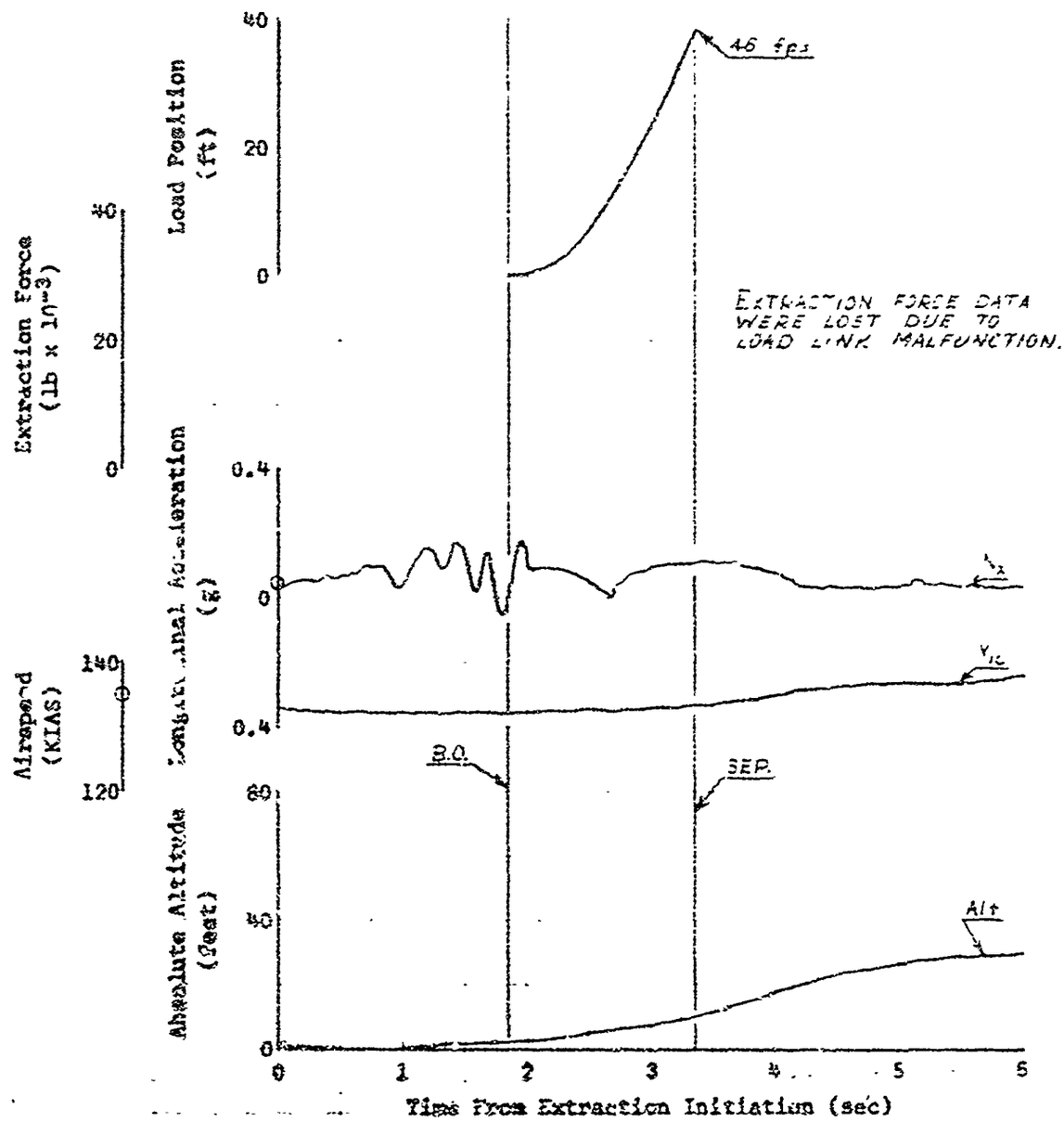


Figure 14. concluded

C-130E USAF S/N 64-0560
A/A32H-4 Rail System
Extraction Number 5

Airplane Gross Weight After Extraction (lb)	(pct MAC)	Load Weight (lb)	Extraction Parachutes no.	dia (ft)	type	Flap Position (pct)	Elevator Trim Tab Position (deg)
	25.0 before drop	25 800	2	28	RS	50	3.0ANU
104 500	25.1 after drop						

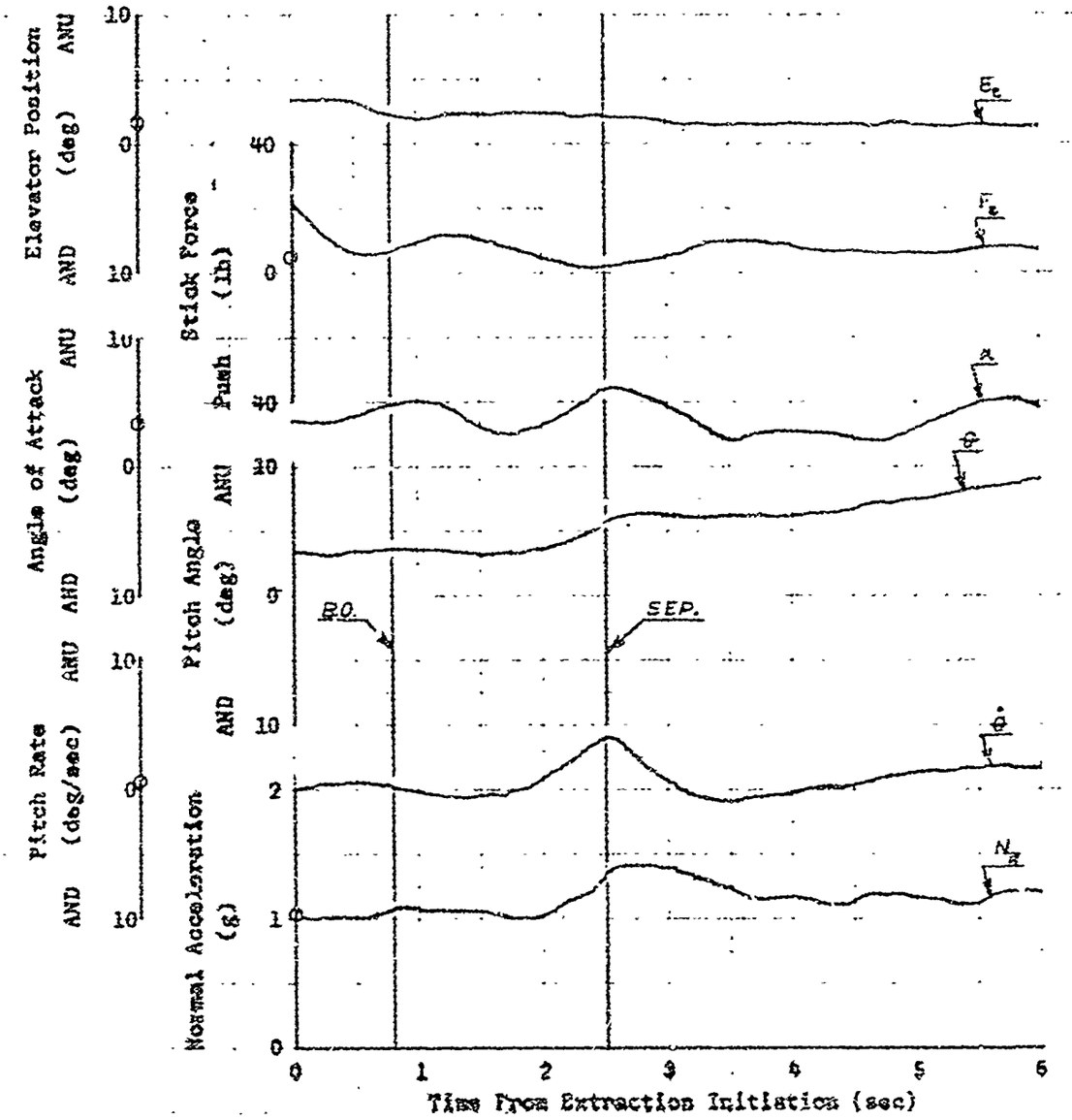


Figure 15 . LAPES Time History

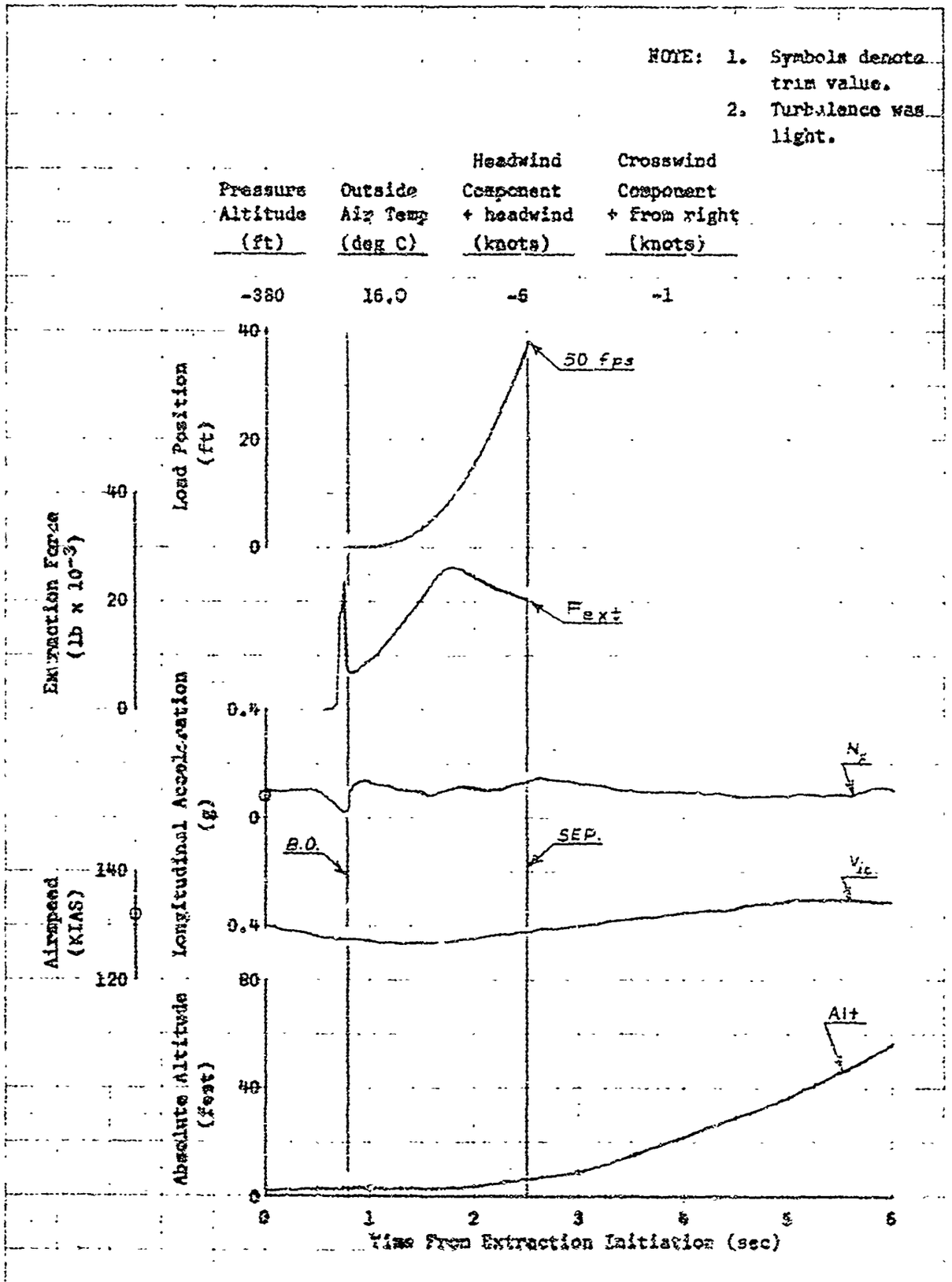


Figure 15 concluded

C-130E USAF S/N 64-0580
A/A32K-4 Rail System
Extraction Number 6

Airplane Gross Weight After Extraction (lb)	Airplane cg (pct MAC)	Load Weight (lb)	Extraction Parachutes no.	dia (ft)	type	Flap Position (pct)	Elevator Trim Tab Position (deg)
106 200	24.5 before drop	18 100	2	28	RS	50	3.0ANU
	24.5 after drop						

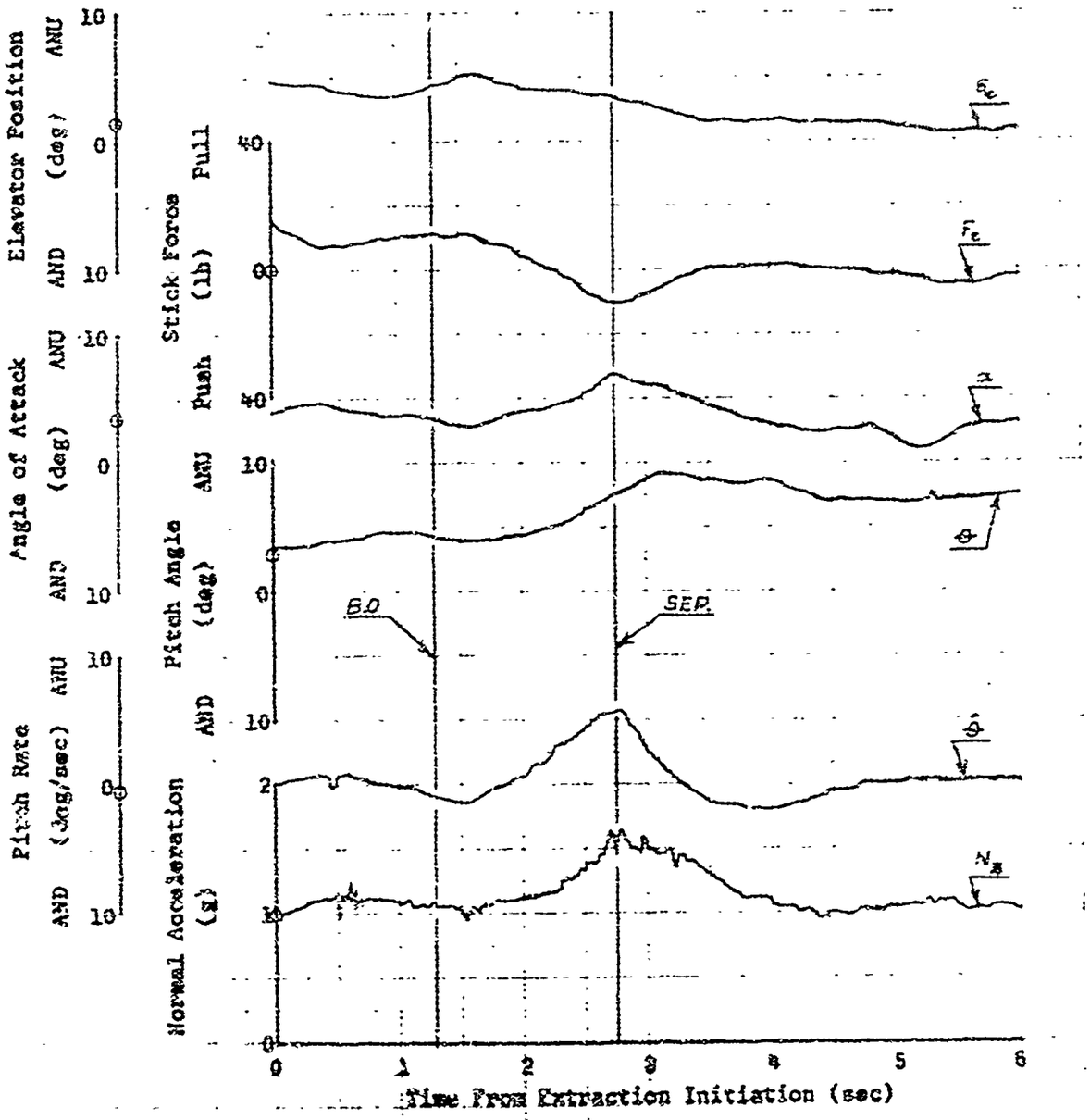


Figure 16 . LAPES Time History

NOTE: 1. Symbols denote trim value.
2. Turbulence was very light.

Pressure Altitude (ft)	Outside Air Temp (deg C)	Headwind Component + headwind (knots)	Crosswind Component + from right (knots)
-60	24.3	-2	-1

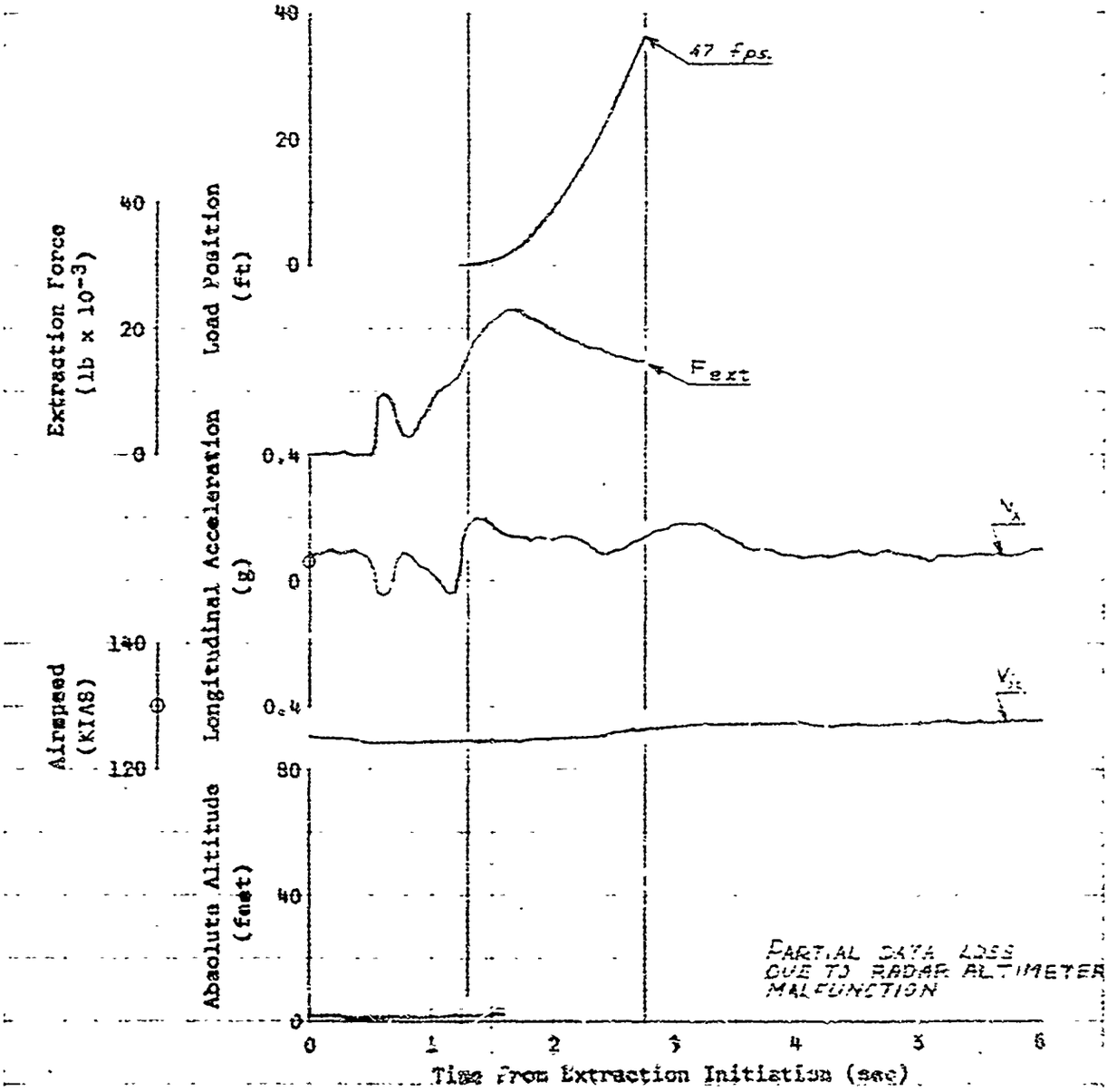


Figure 15 concluded

C-~~130E~~ USAF S/N 64-0560
A/A32H-4 Rail System
Extraction Number 7

Airplane Gross Weight After Extraction (lb)	Airplane cg (pct MAC)	Load Weight (lb)	Extraction Parachutes no.	dia (ft)	type	Flap Position (pct)	Elevator Trim Tab Position (deg)
	25.1 before drop	18 000	2	28	RS	70	5.0 ANU
106 200	25.3 after drop						

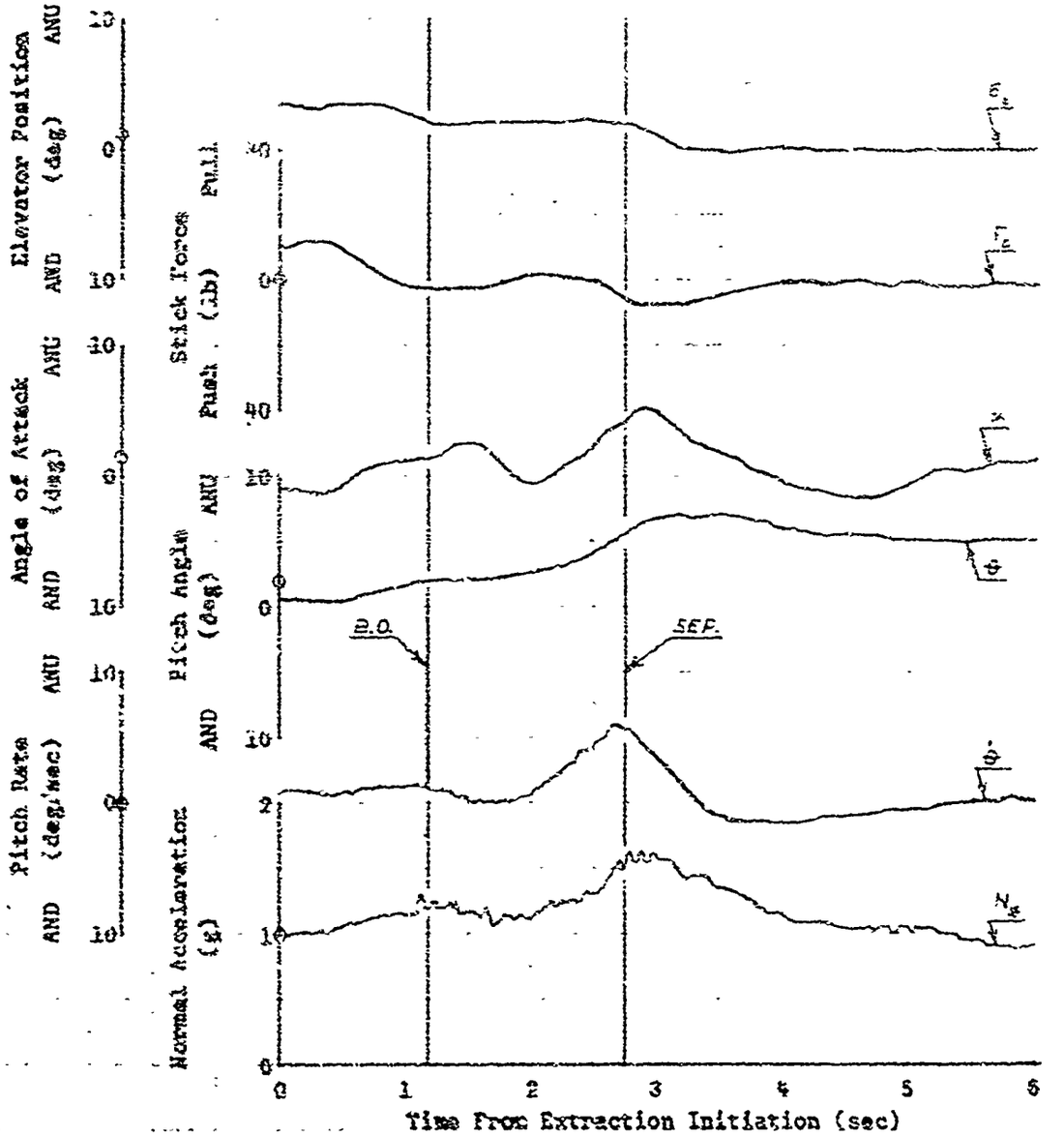


Figure 17 . LAPES Time History

NOTE: 1. Symbols denote trim value.
2. Turbulence was very light.

Pressure Altitude (ft)	Outside Air Temp (deg C)	Headwind Component + headwind (knots)	Crosswind Component + from right (knots)
-145	26.0	-2	0

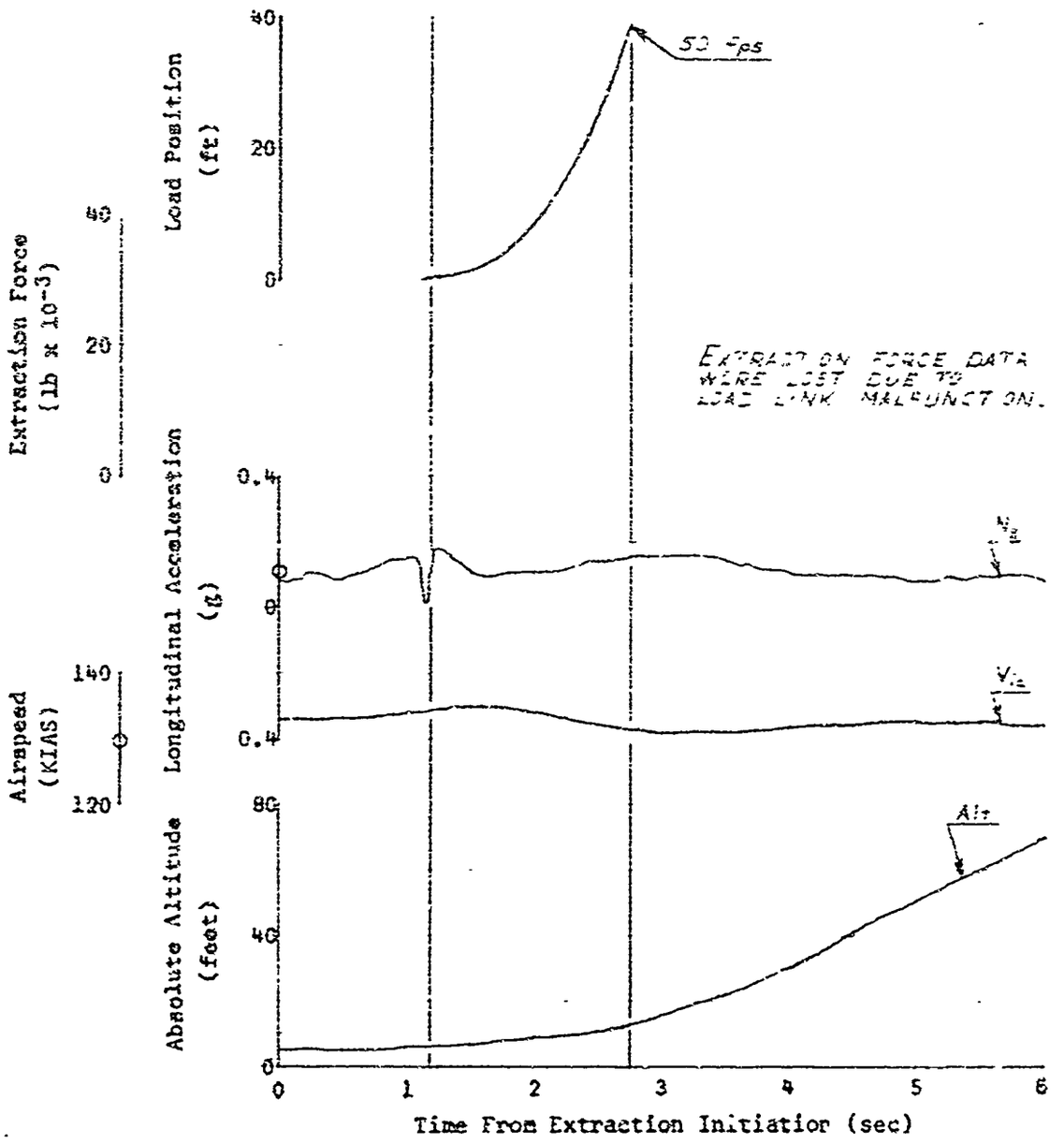


Figure 17 concluded

C-[illegible] MSAT S/N [illegible]

AVS12M-4 Ball System

Extraction Number 6

	Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (part MAC)	Airplane cg After Extraction (part MAC)	Load Weight (lb)	Extraction Parachutes no.	dia (ft)	type
(a)		25.2	23.0	8100	1	28	ra
(a)	[illegible]	25.0	25.3	7900	1	28	ra

Figure 18 . [illegible] Time History

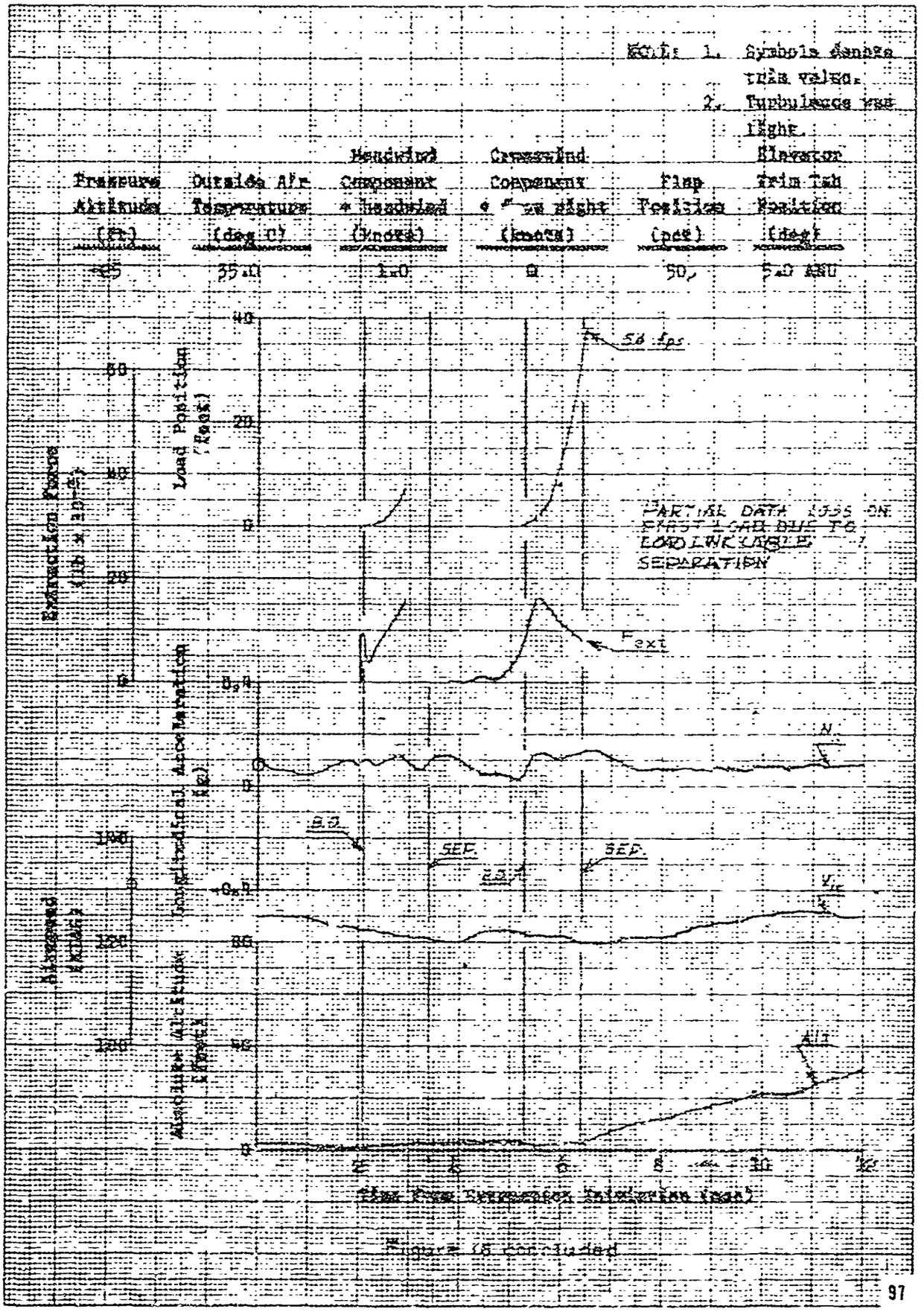


Figure 15 Concluded

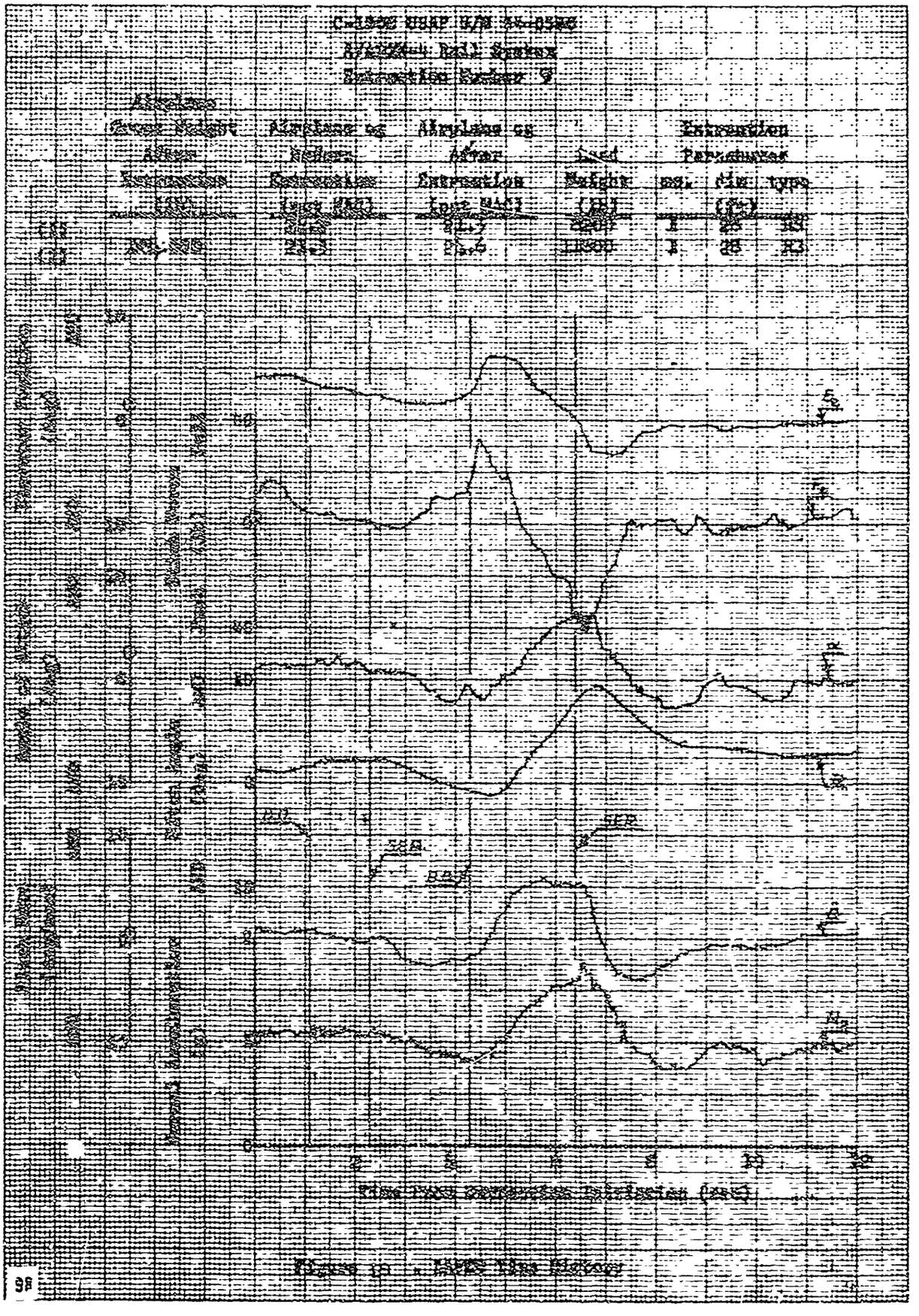


Figure 10. Wing flow history

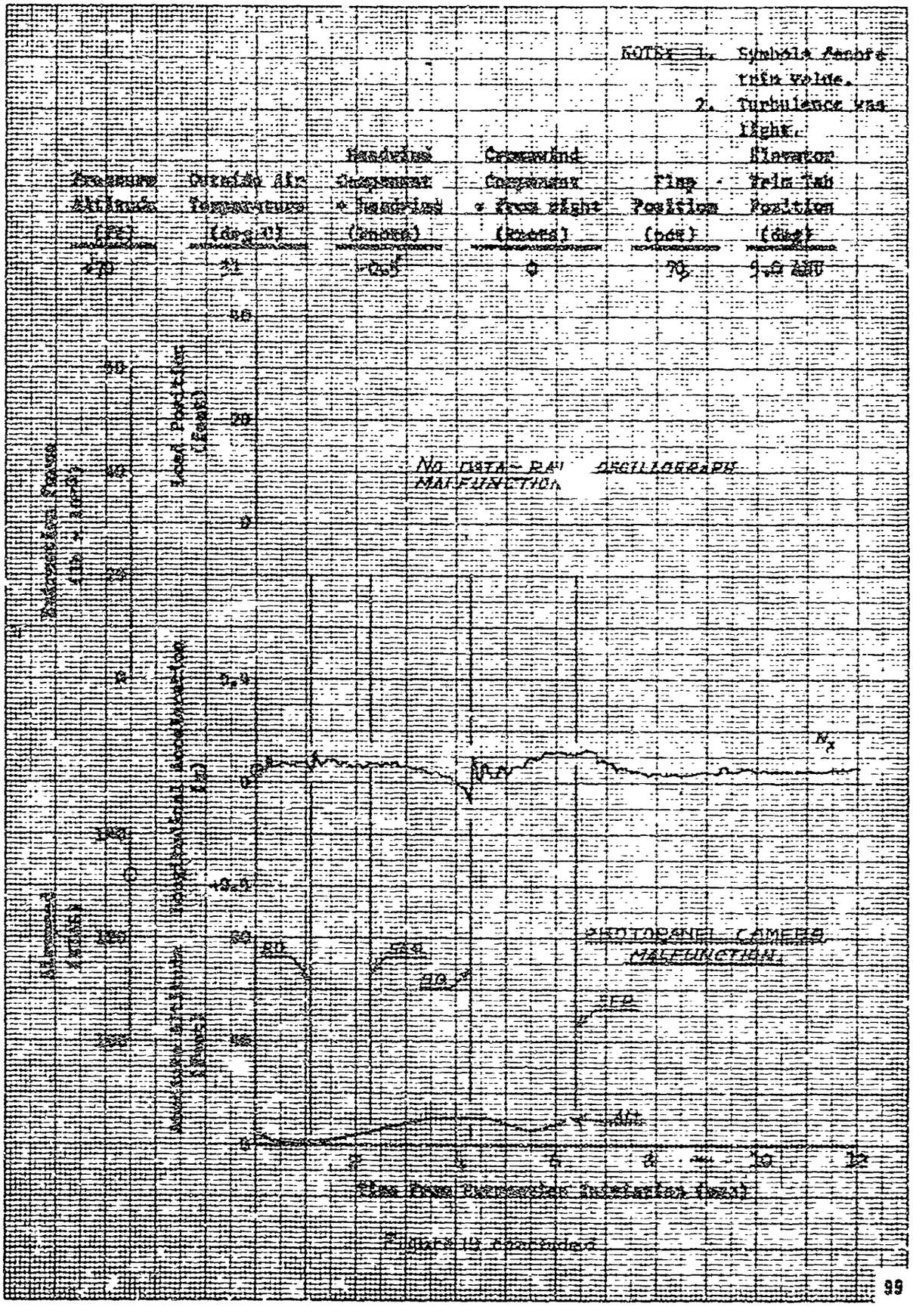
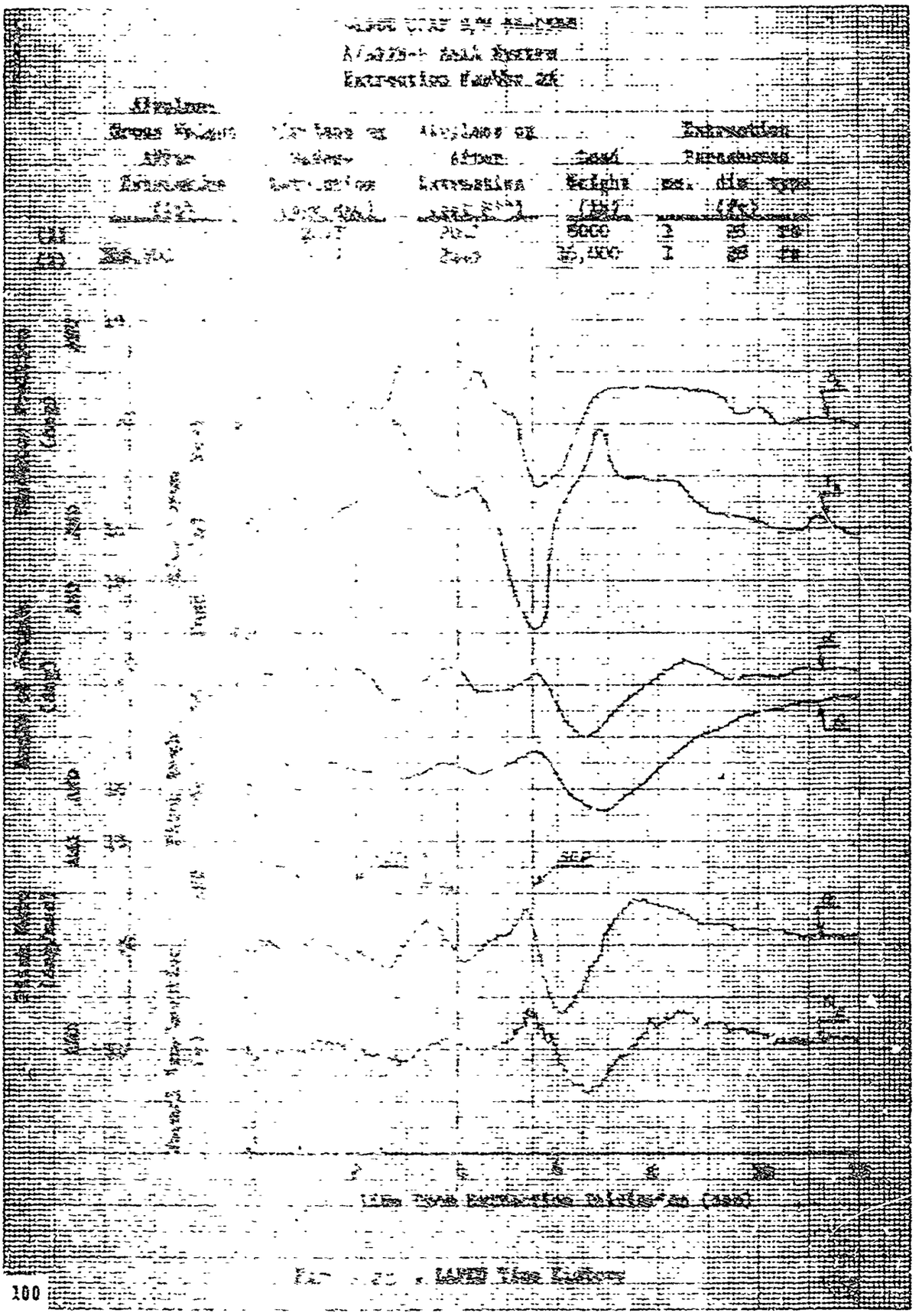
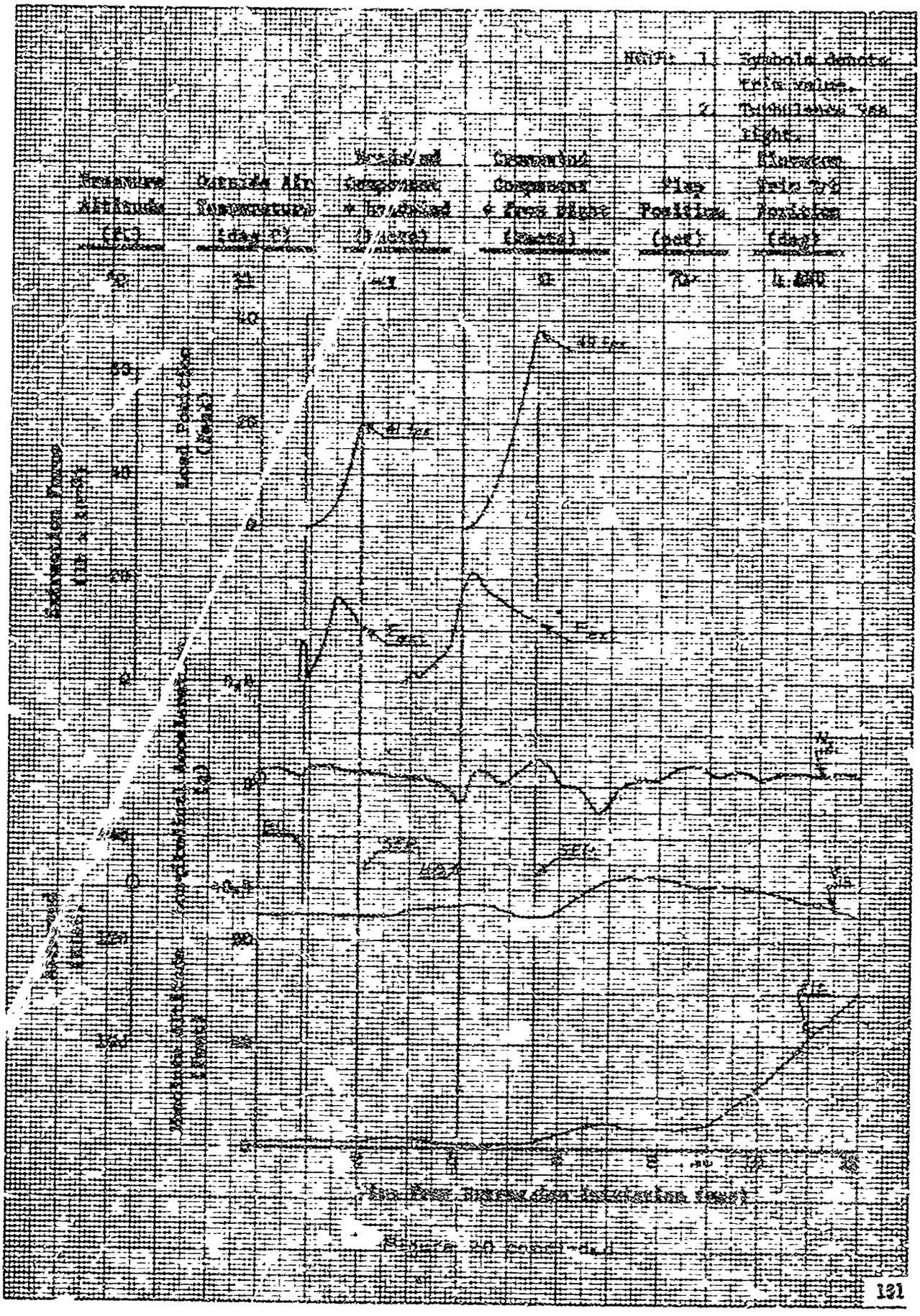


Figure 15 continued



100



C-135E USAF S/N 64-14840

A/A42H-4 Ball System

Extraction Number 18

	Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (per MAC)	Airplane cg After Extraction (per MAC)	Load Weight (lb)	Extraction Parachutes no.	dia. (ft)	type
(1)		25.4	21.3	8000	1	25	ringsail
(2)	105,200	21.3	25.6	15,900	1	28	ringsail

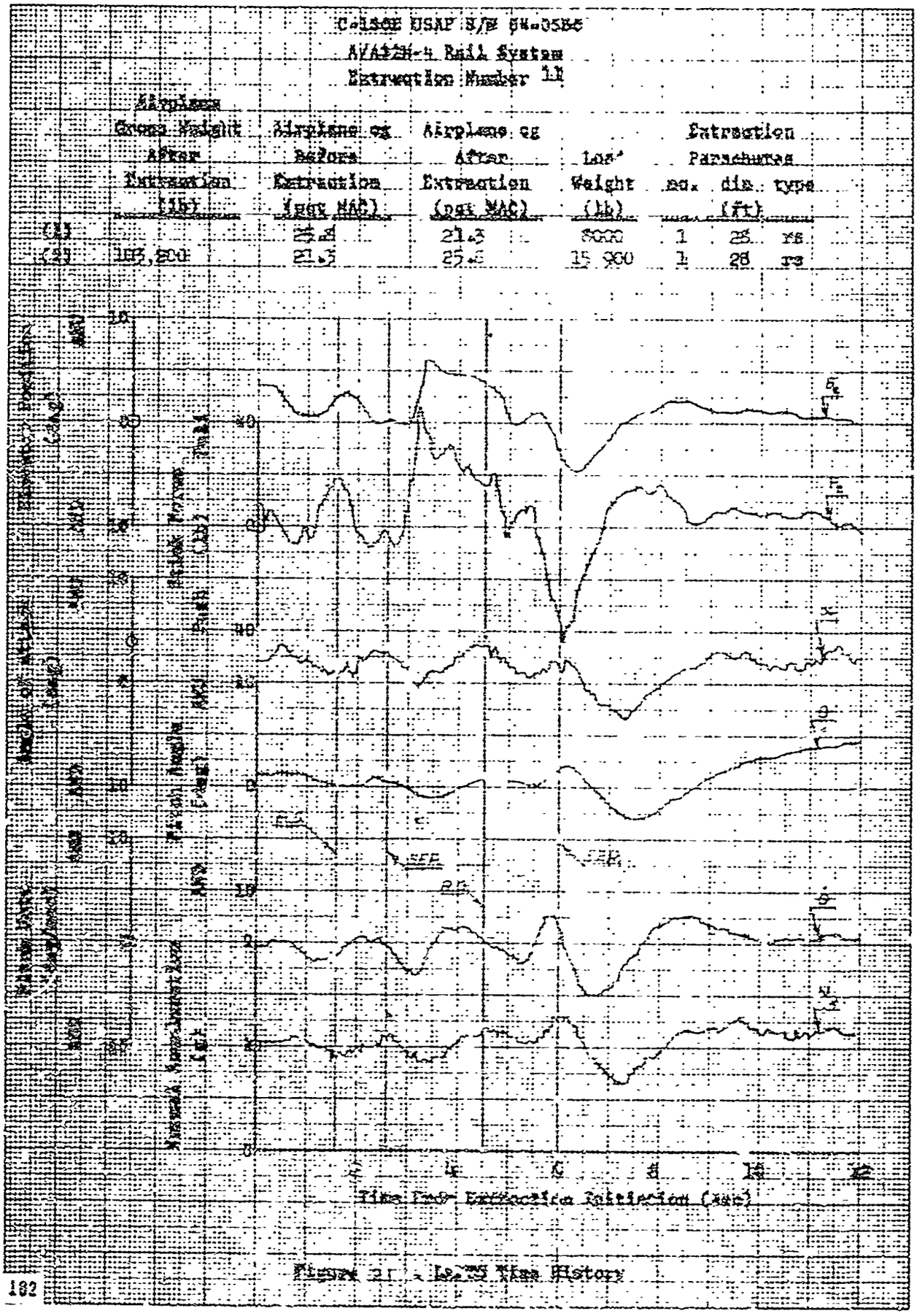


Figure 21. Test Time History

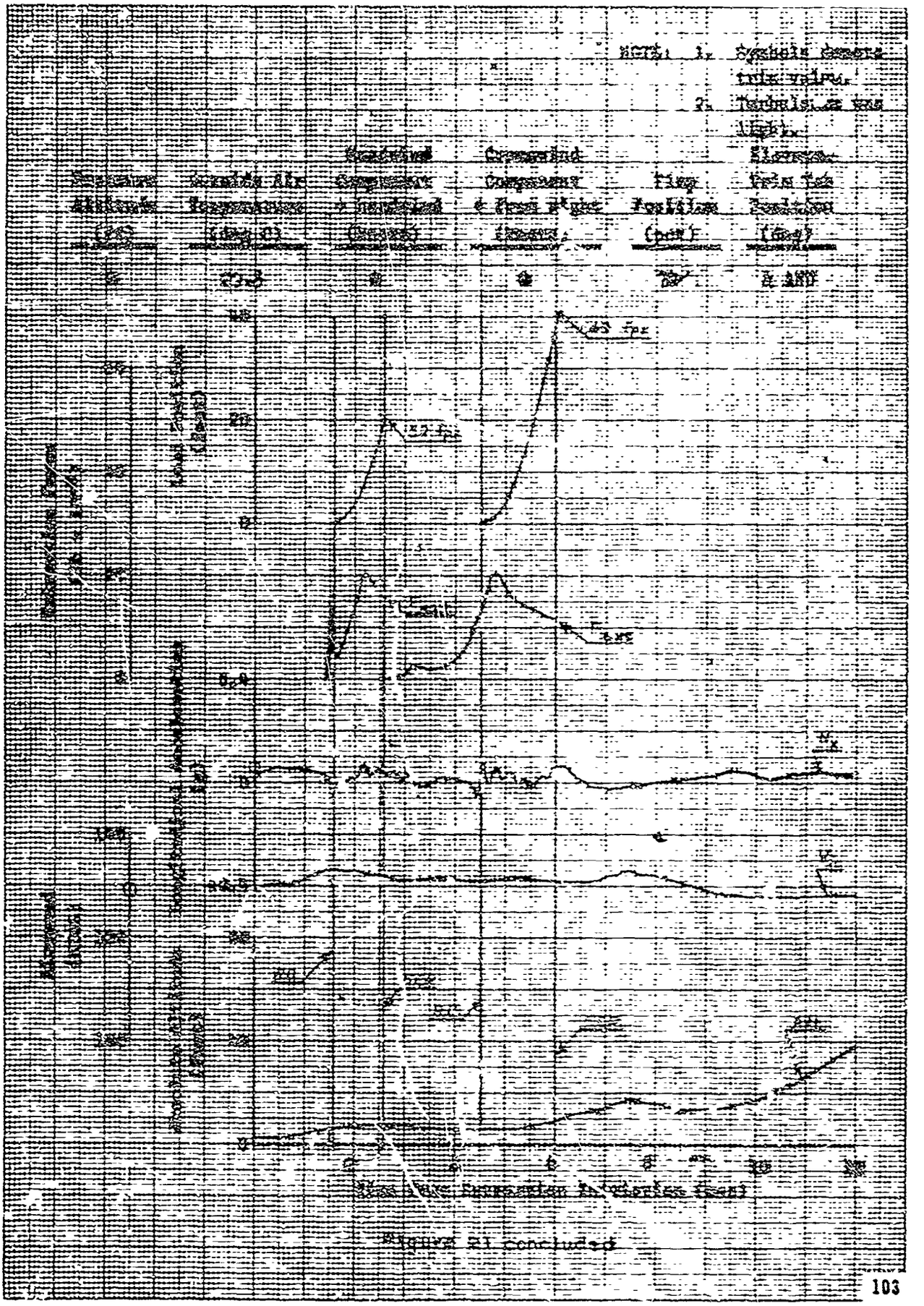
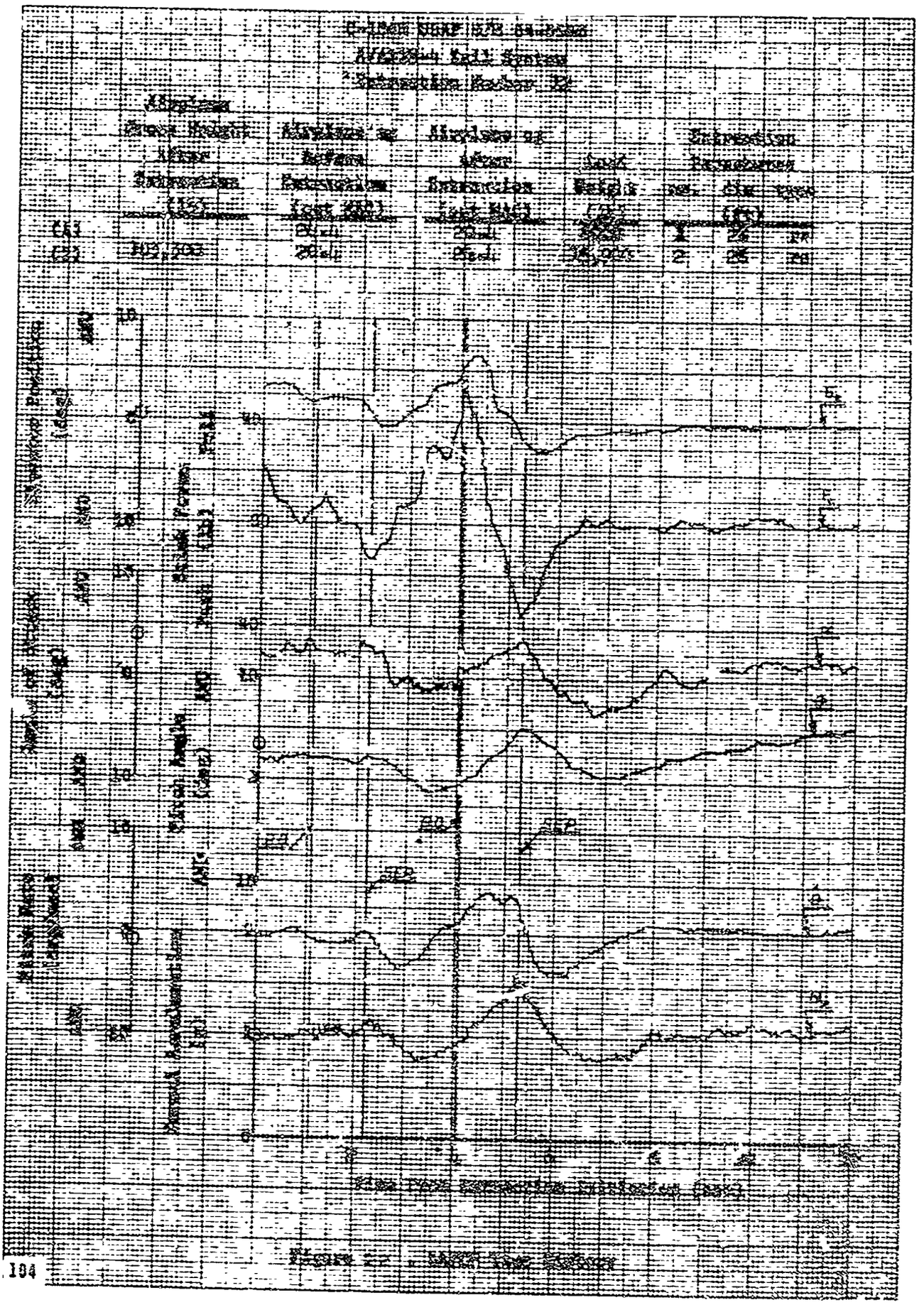
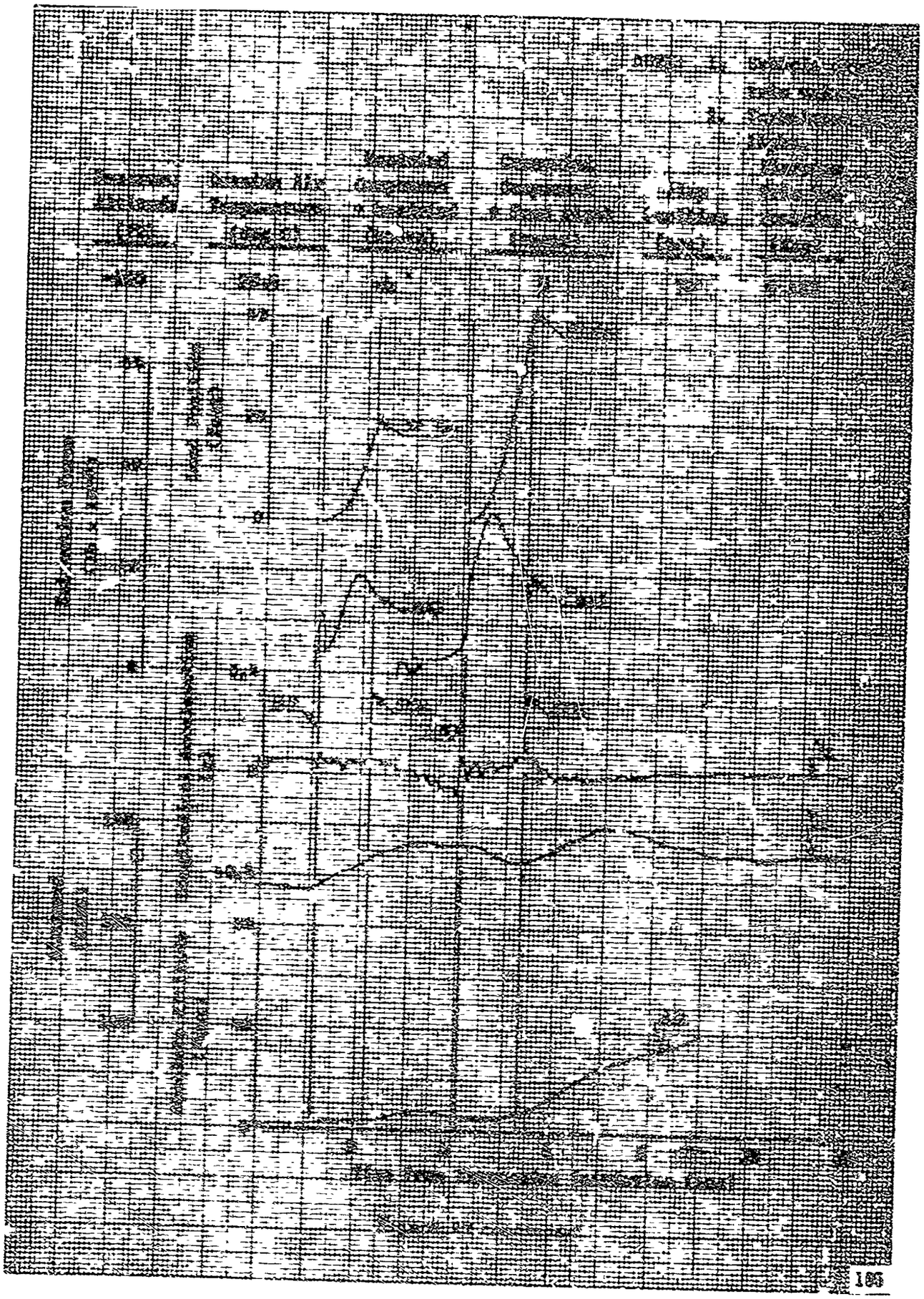
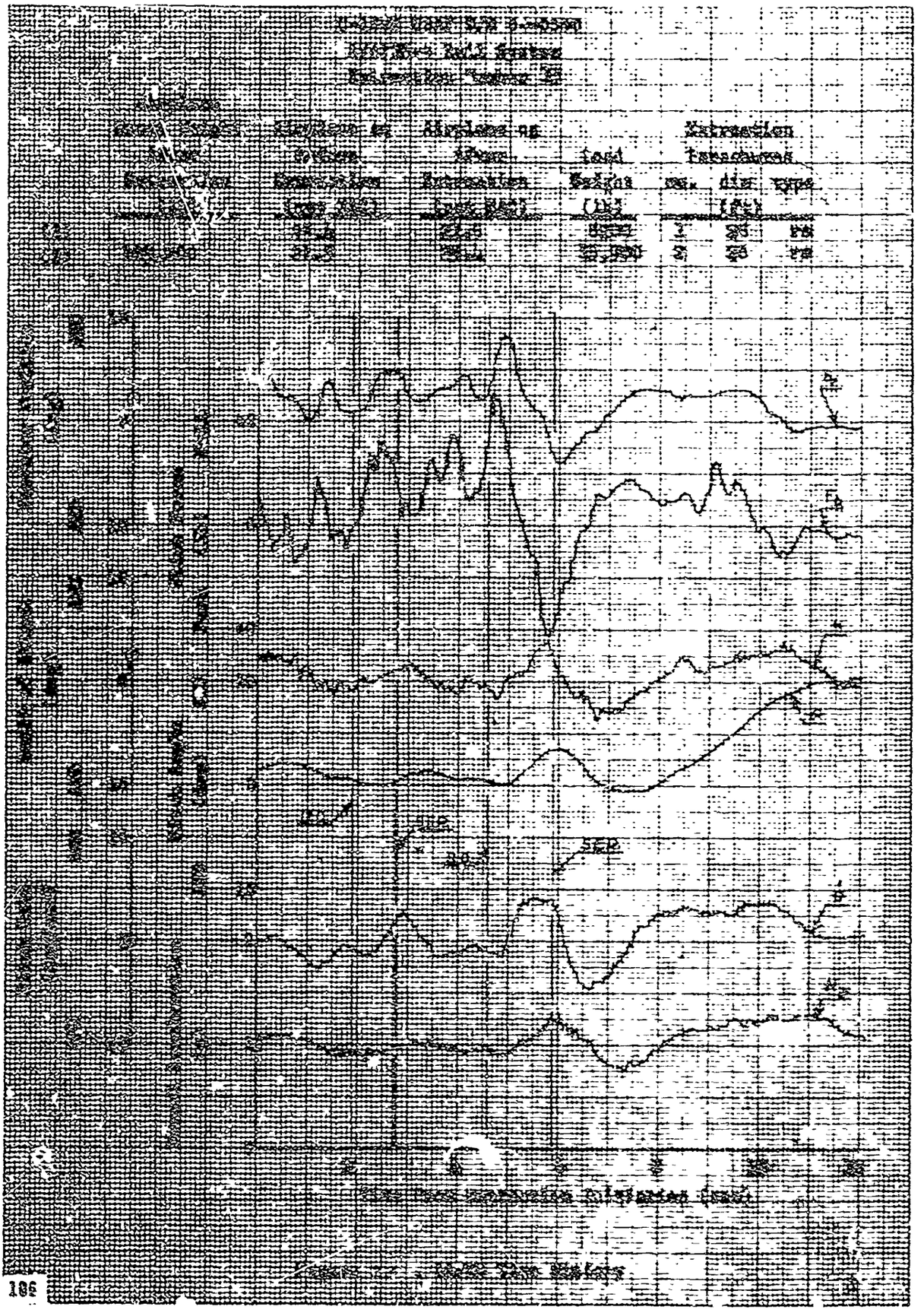


Figure 21 concluded







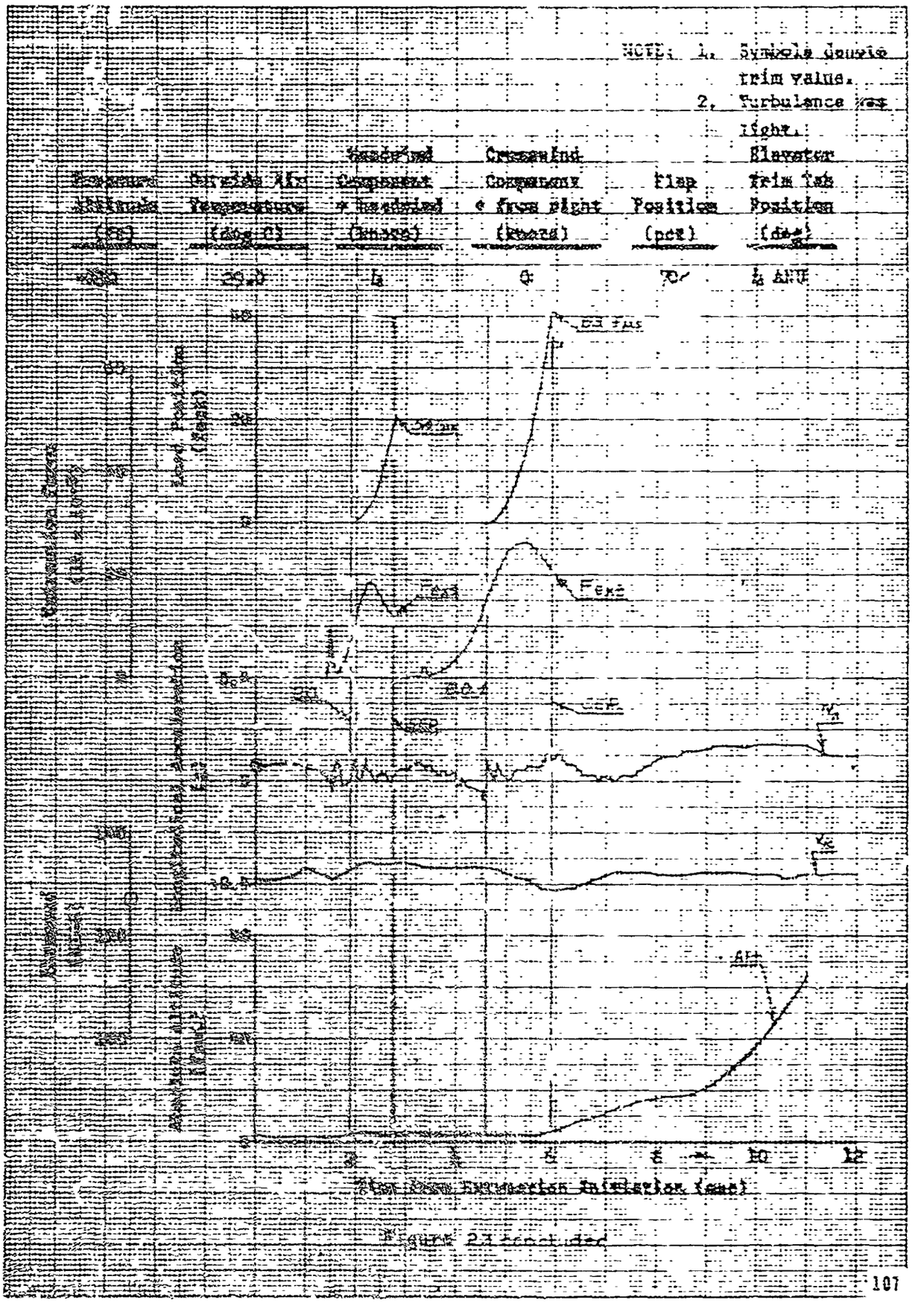


Figure 23 Concluded

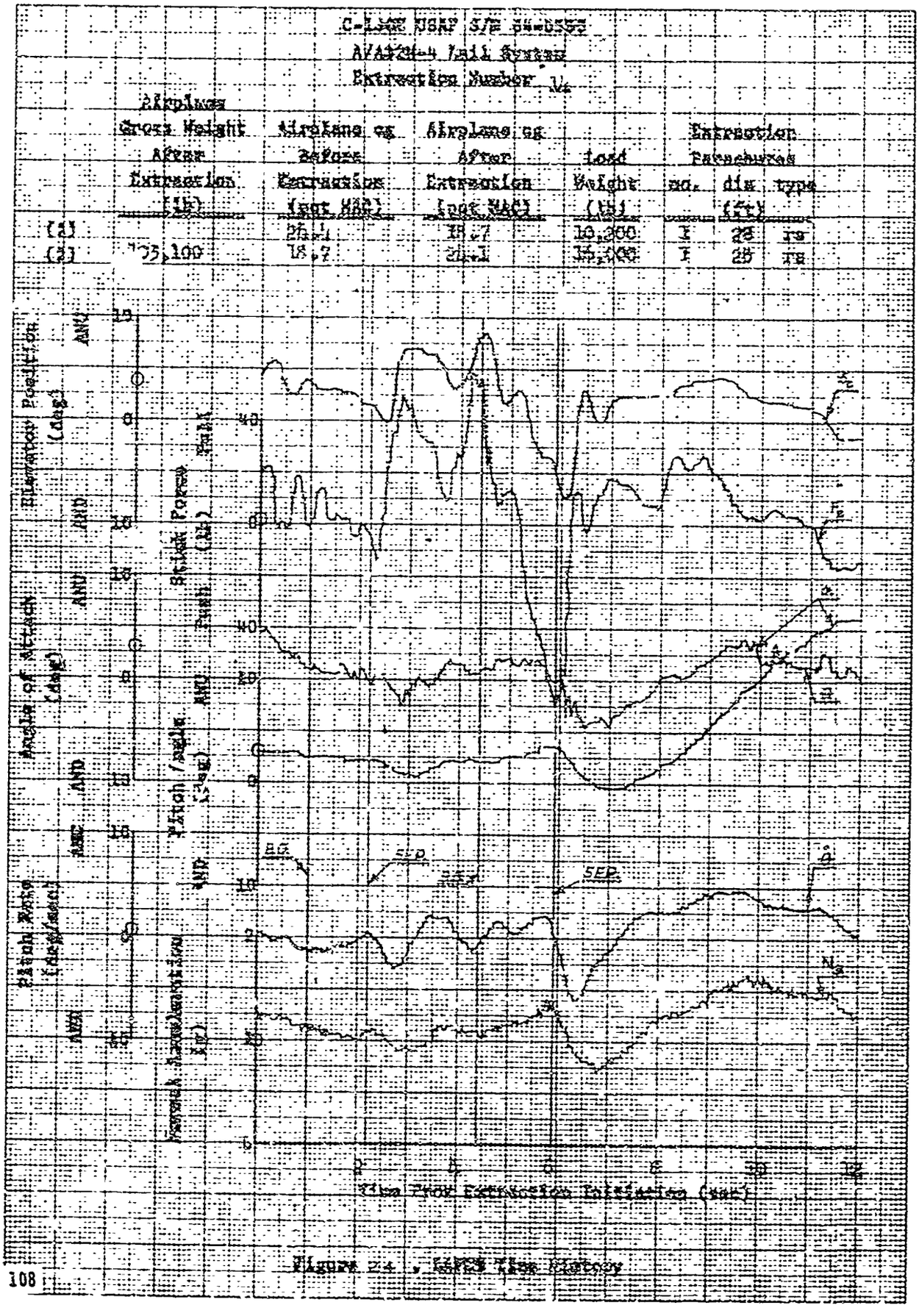


Figure 24. Radar Plot History

NOTE: 1. Symbols denote trim value.
2. Turbulence was moderate.

Pressure Altitude (ft)	Outside Air Temperature (deg C)	Headwind Component (knots)	Crosswind Component From Right (knots)	Flap Position (per)	Elevator Trim Tab Position (deg)
10	23.5	7.5	0	70	-3.0

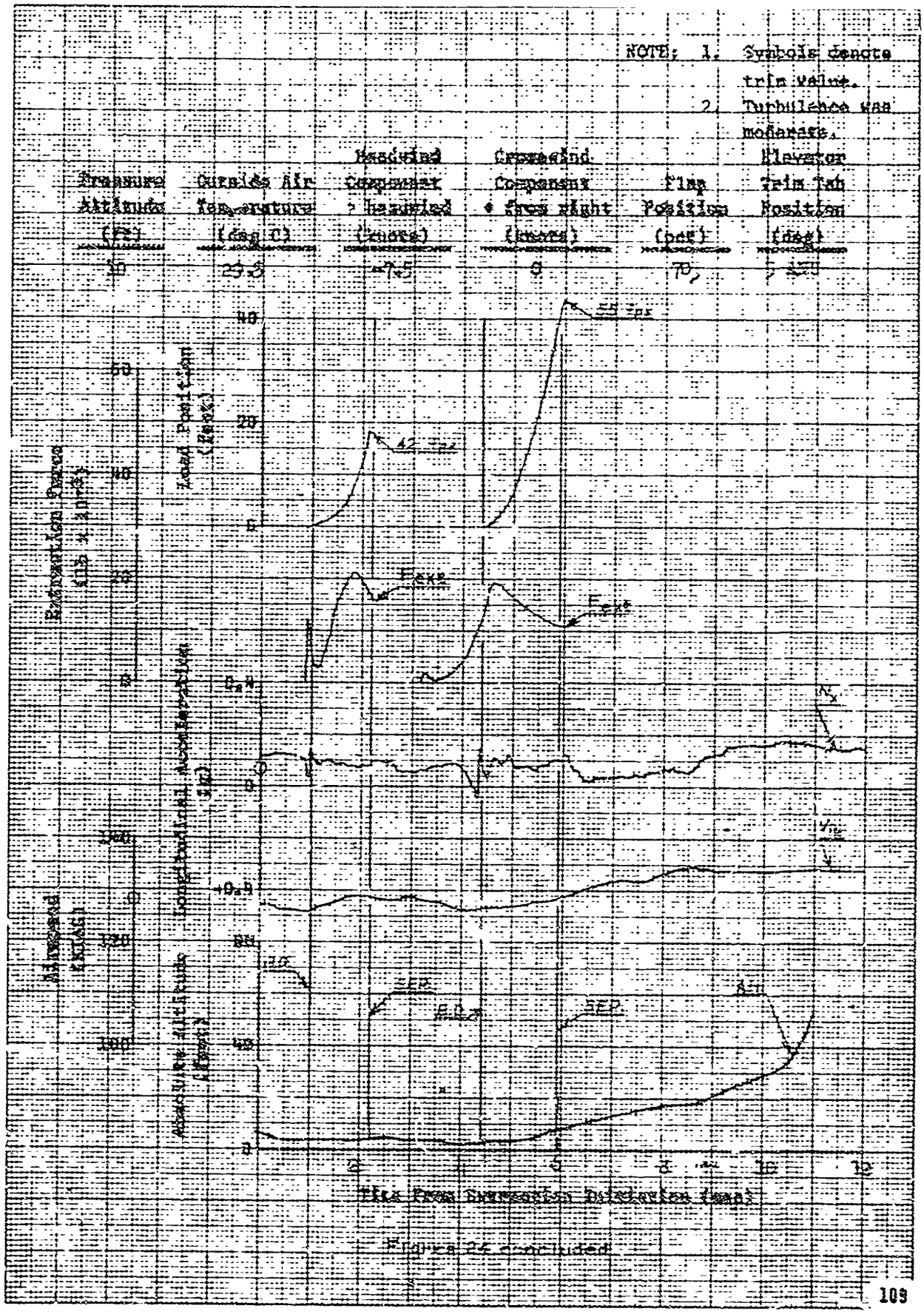


Figure 24 concluded

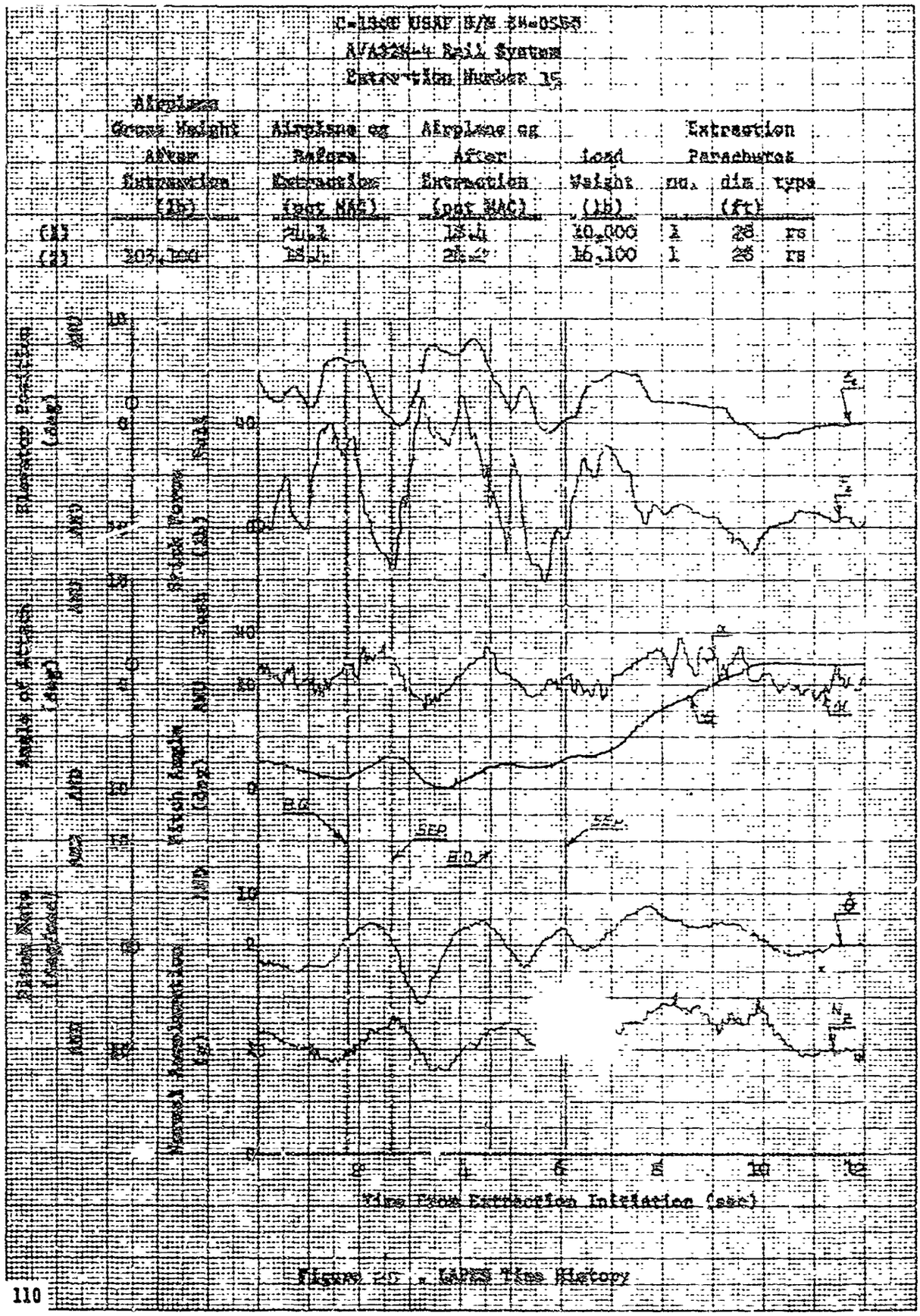


Figure 25 - LAPES Time History

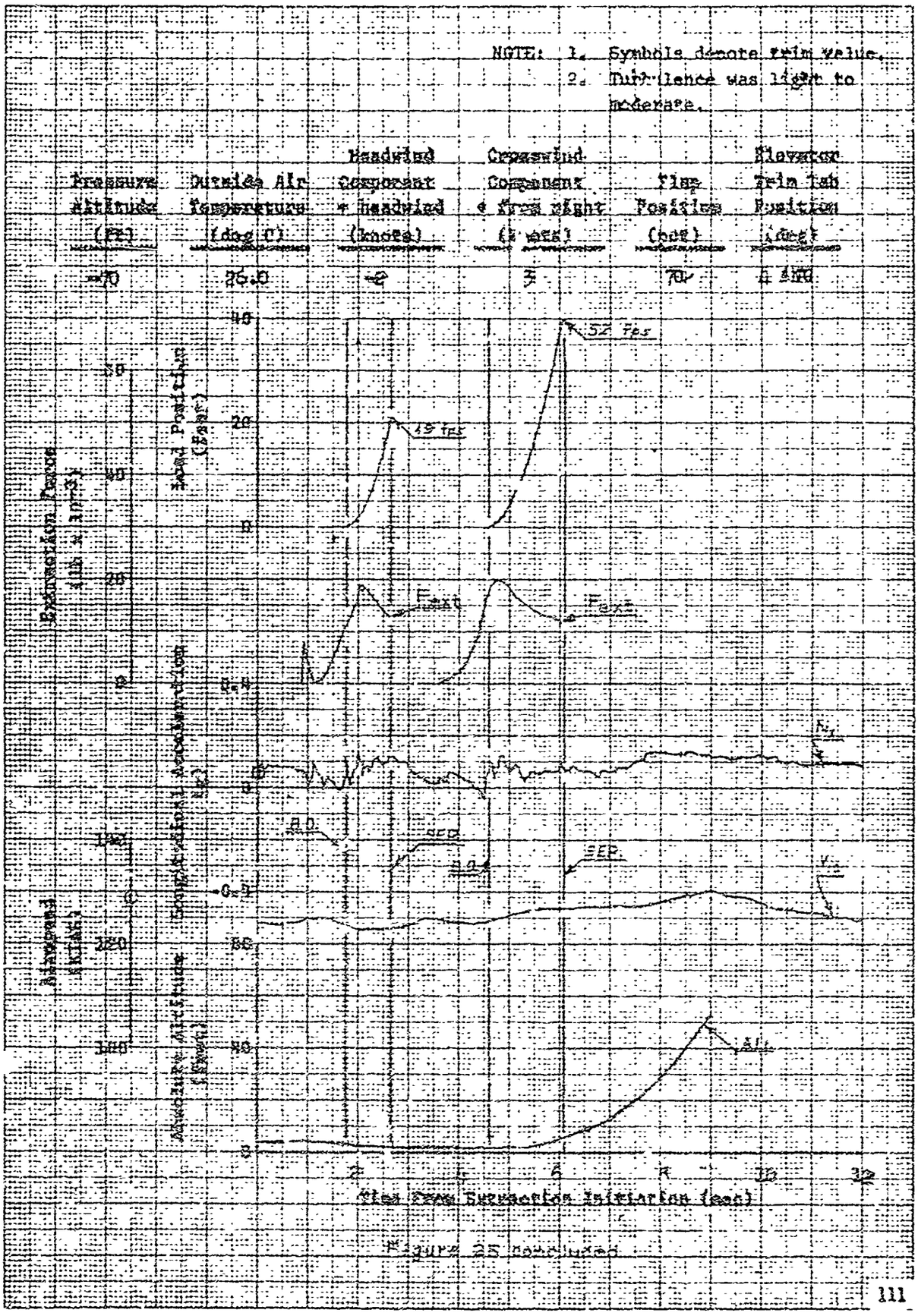


Figure 25 concluded

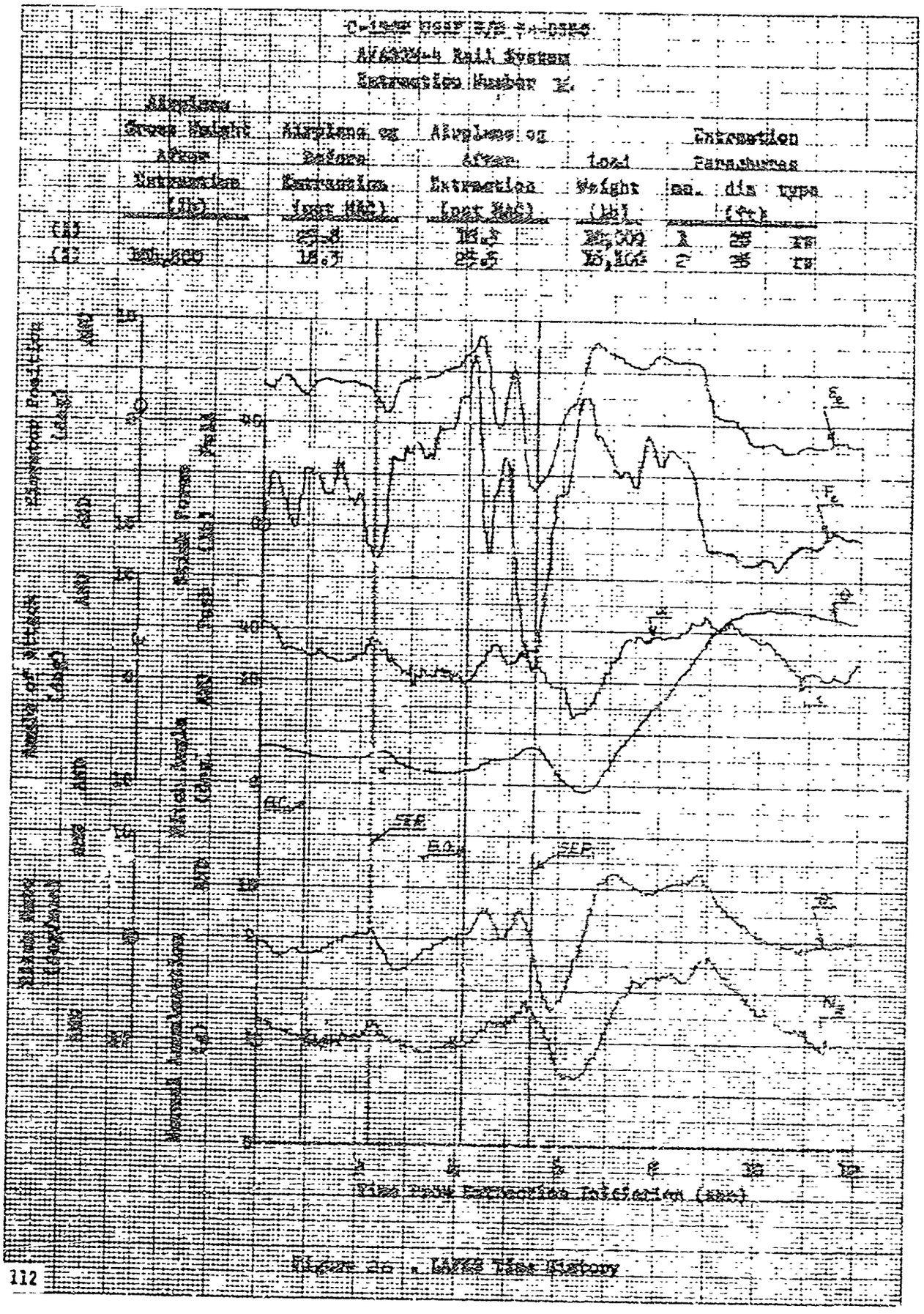
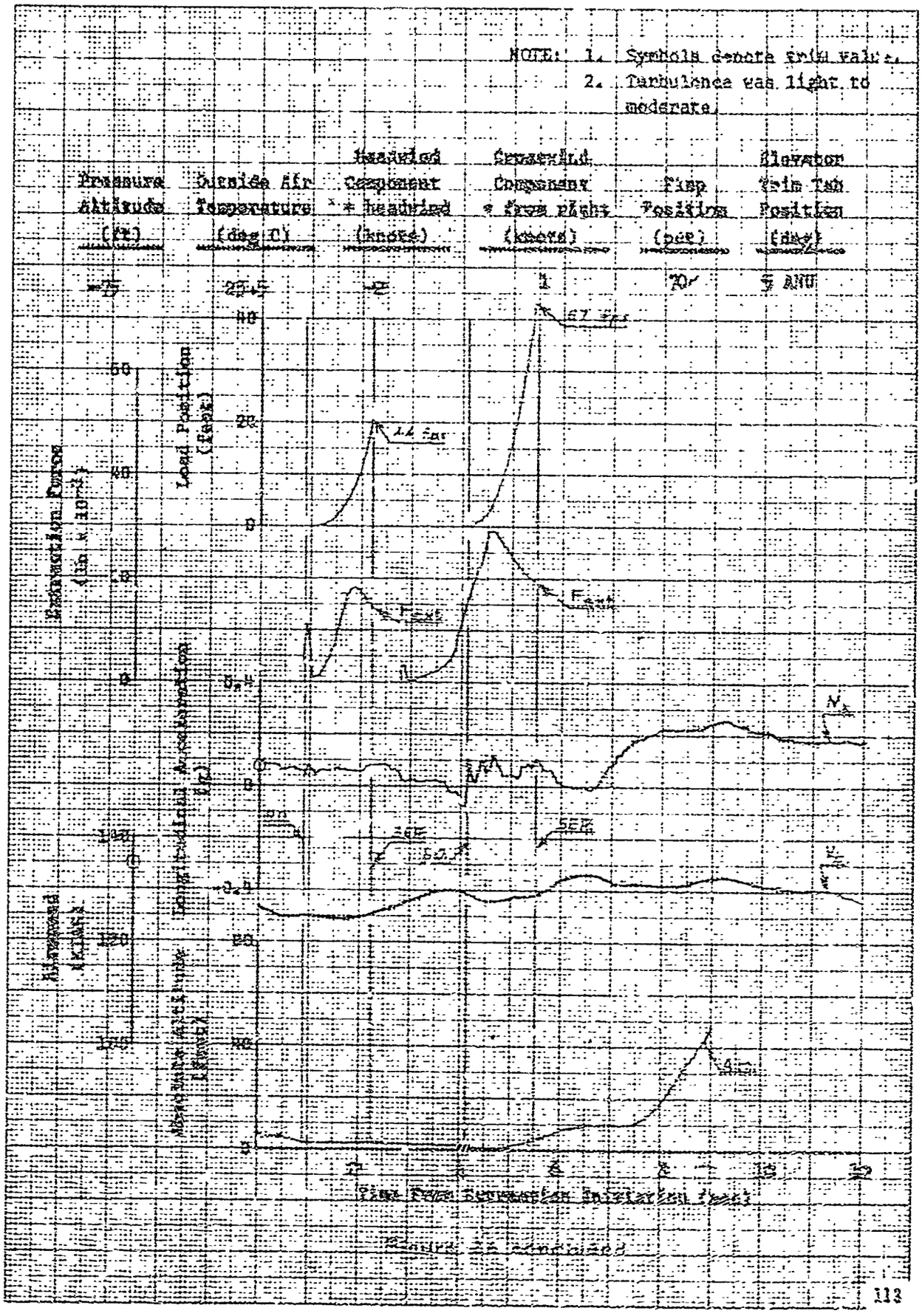
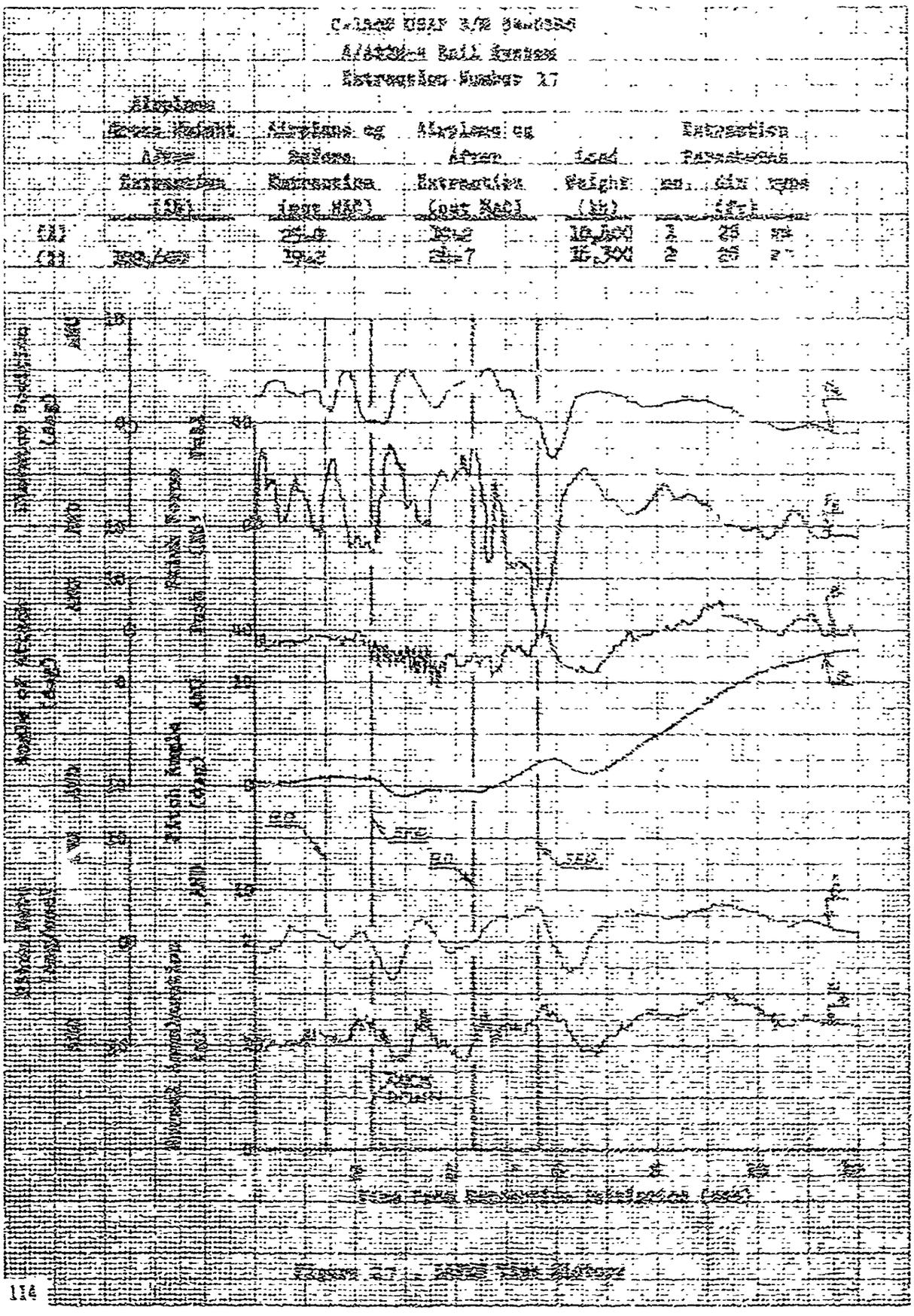
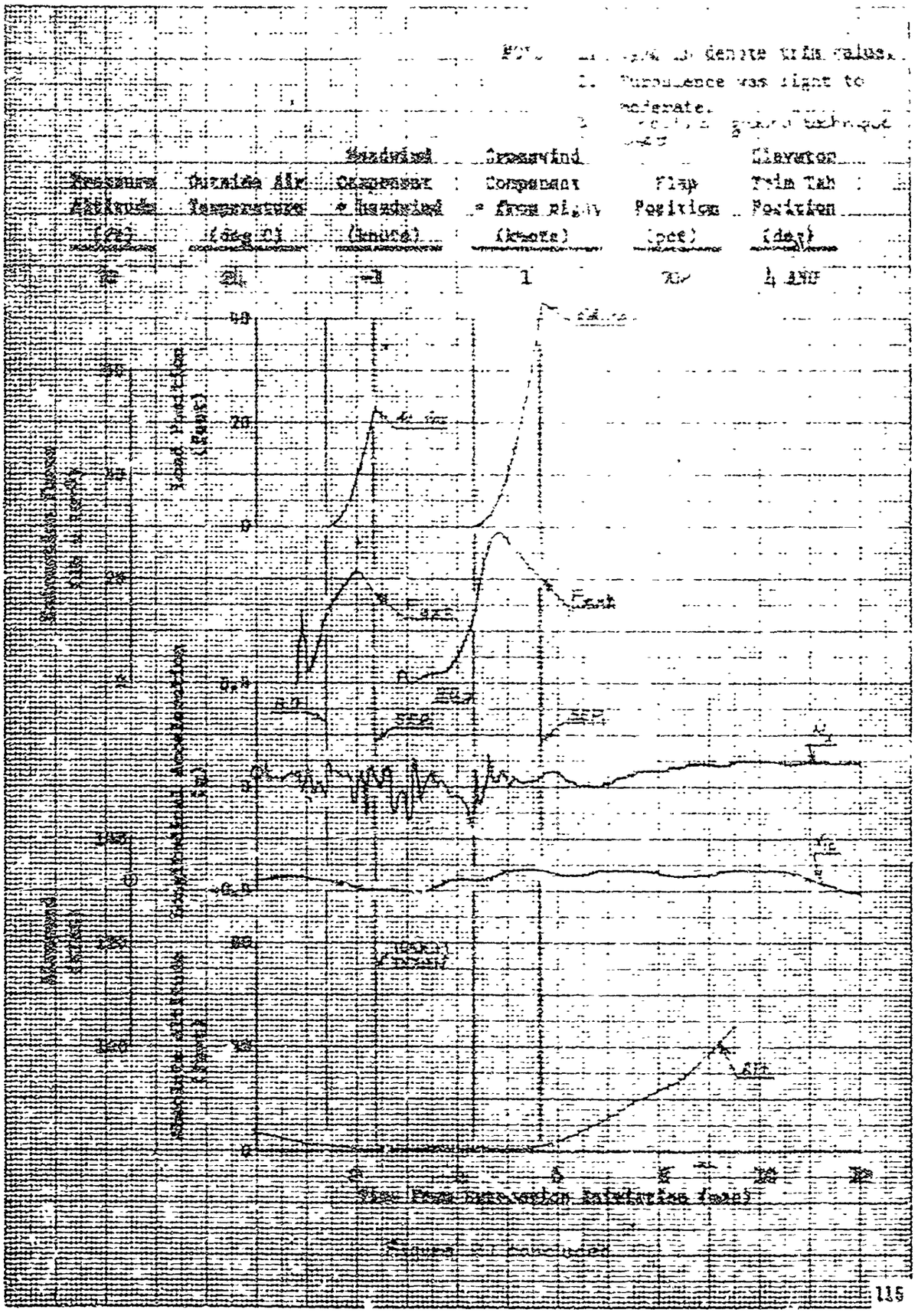


Figure 2a - Loads Time History


NOTE: 1. Symbols denote trim values.
2. Turbulence was light to moderate.
Pressure Altitude (ft)
Outside Air Temperature (deg C)
Headwind Component * headwind (knots)
Crosswind Component * from right (knots)
Flap Position (pct)
Elevator Trim Tab Position (deg)
70
5 AND
Load Position (fore)
Acceleration (fore)
Acceleration (aft)
Time From Separation Initiation (sec)




Pressure Altitude (ft)
Outside Air Temperature (deg C)
Windshield Compressor Unbalance (knots)
Crosswind Component from right (knots)
Flap Position (per)
Elevator Trim Tab Position (deg)
1
Time from interception initiation (sec)

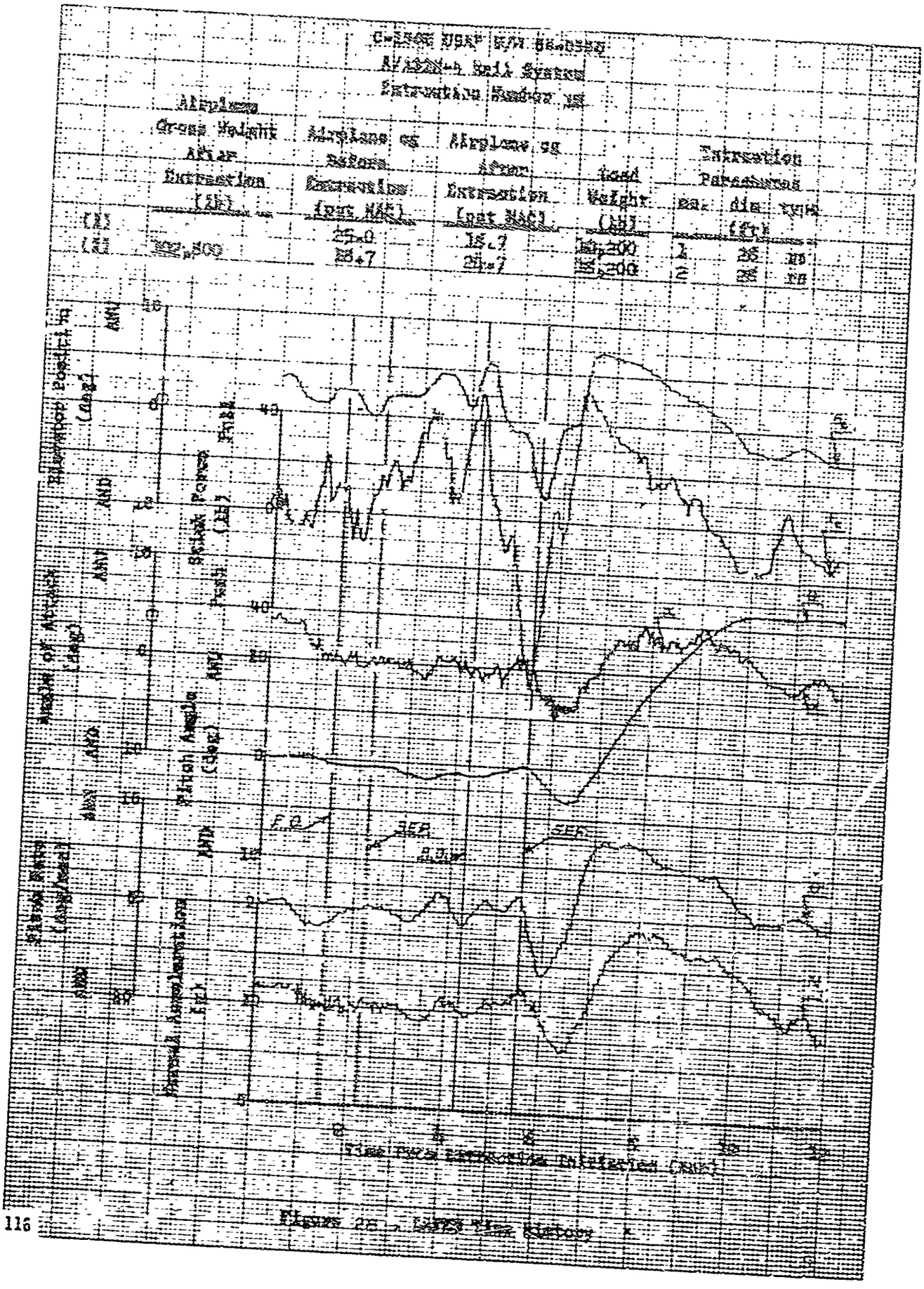


Figure 25. Large Pilot Inputs

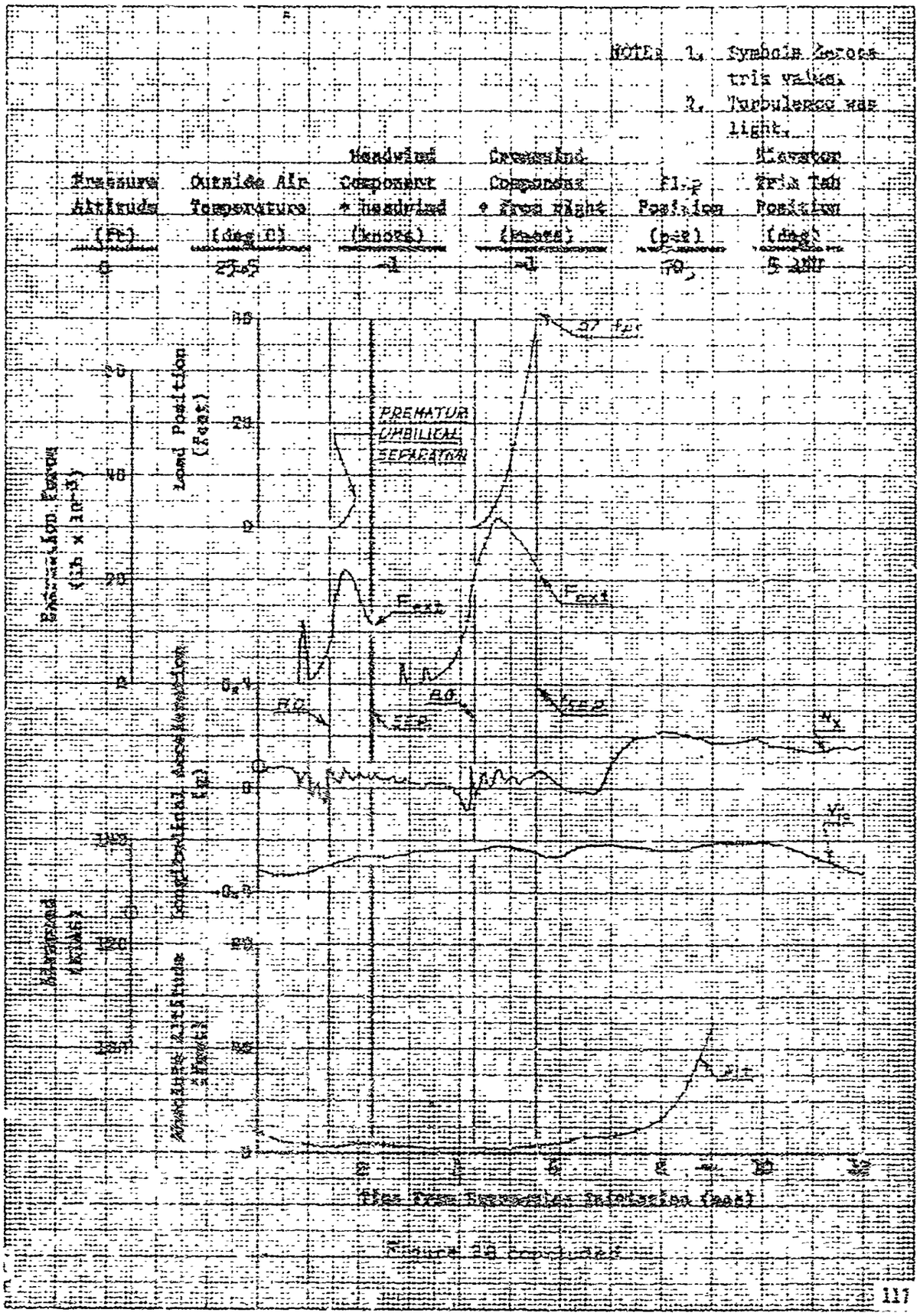


Figure 28 Continued

C-130E USAF S/N 64-0580

AFAATM-4 Rail System

Extraction Number 19

	Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (pct MAC)	Airplane cg After Extraction (pct MAC)	Load Weight (lb)	Extraction Parachutes no.	dia (ft)	type
(1)		25.6	19.2	10,200	1	28	TS
(2)	136,000	19.8	25.2	18,000	2	28	TS

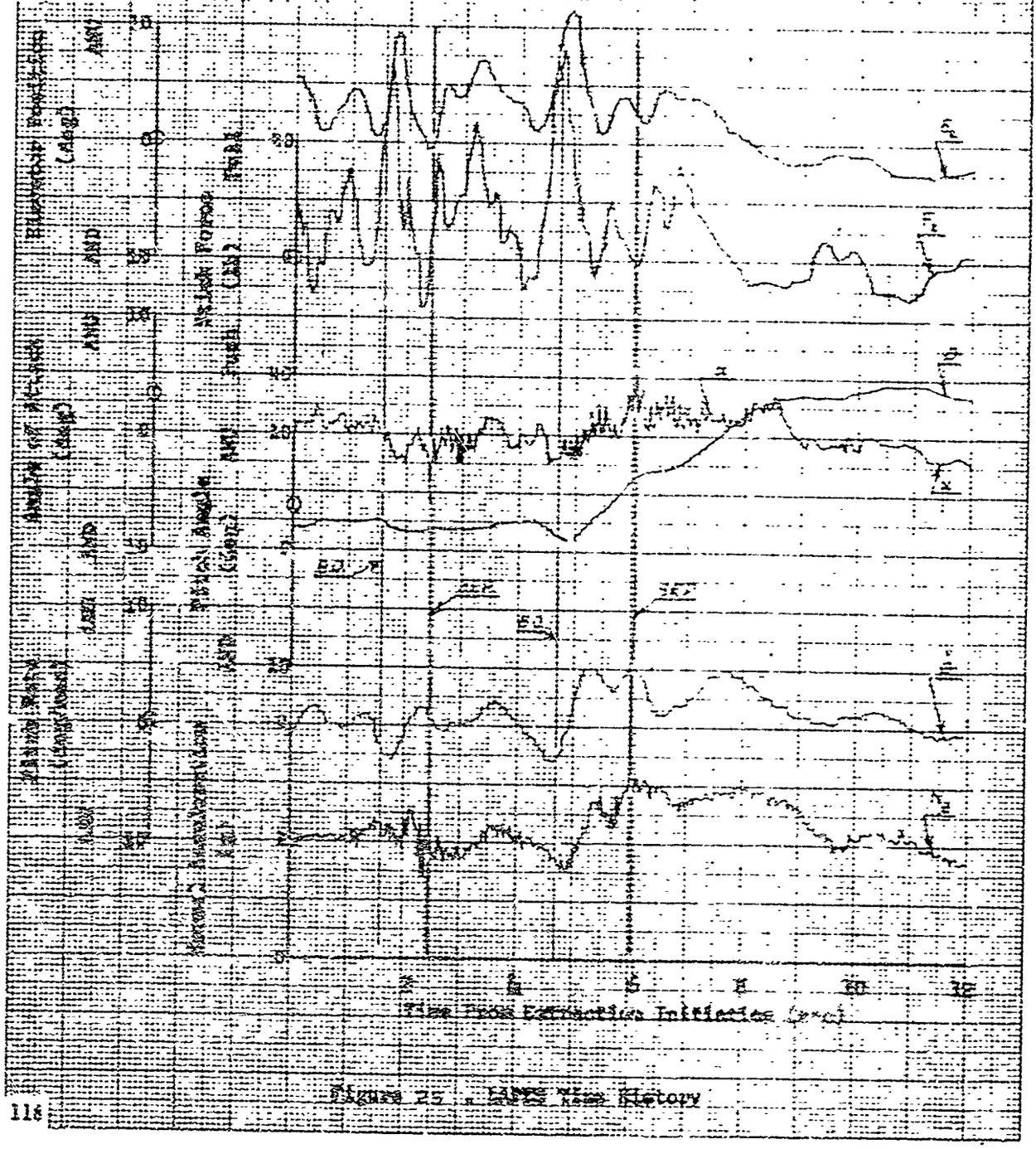


Figure 25. Loads Time History

NOTE: 1. Symbols denote trim value.
2. Turbulence was light.

Pressure Altitude (ft)	Outside Air Temperature (deg C)	Headwind Component + Headwind (knots)	Crosswind Component + from Right (knots)	Flap Position (pct)	Elevator Trim Tab Position (deg)
-35	29.5	0	-1	70	5 ANU

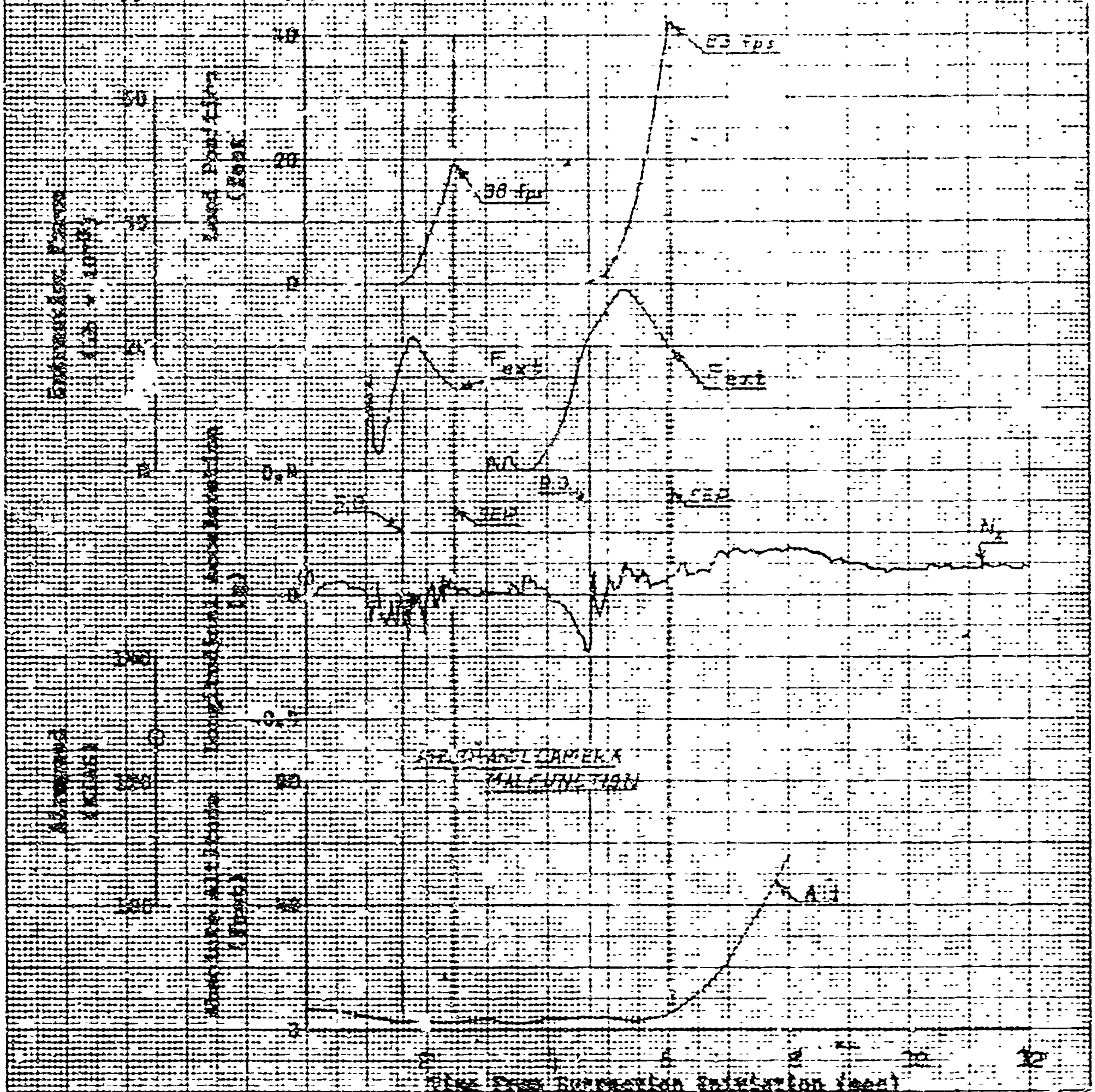


Figure 29 concluded

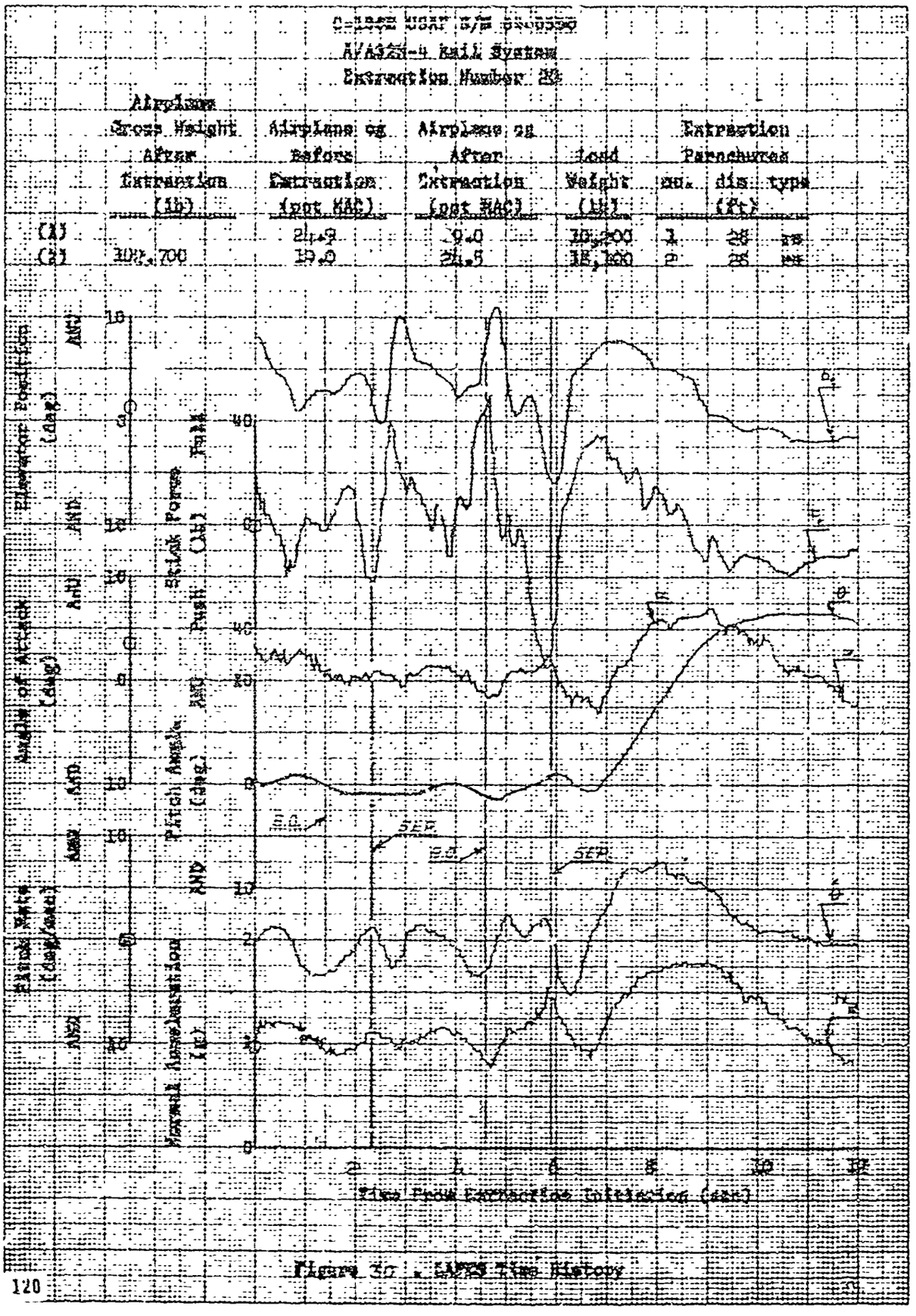


Figure 30 . [illegible] Time History

NOTE: 1. Symbols denote trim value.
2. Turbulence was light.

Pressure Altitude (Ft)	Outside Air Temperature (deg C)	Headwind Component + headwind (knots)	Crosswind Component + from right (knots)	Flap Position (pce)	Elevator Trim Tab Position (deg)
20	31.5	-0.5	0.5	70	4 AND

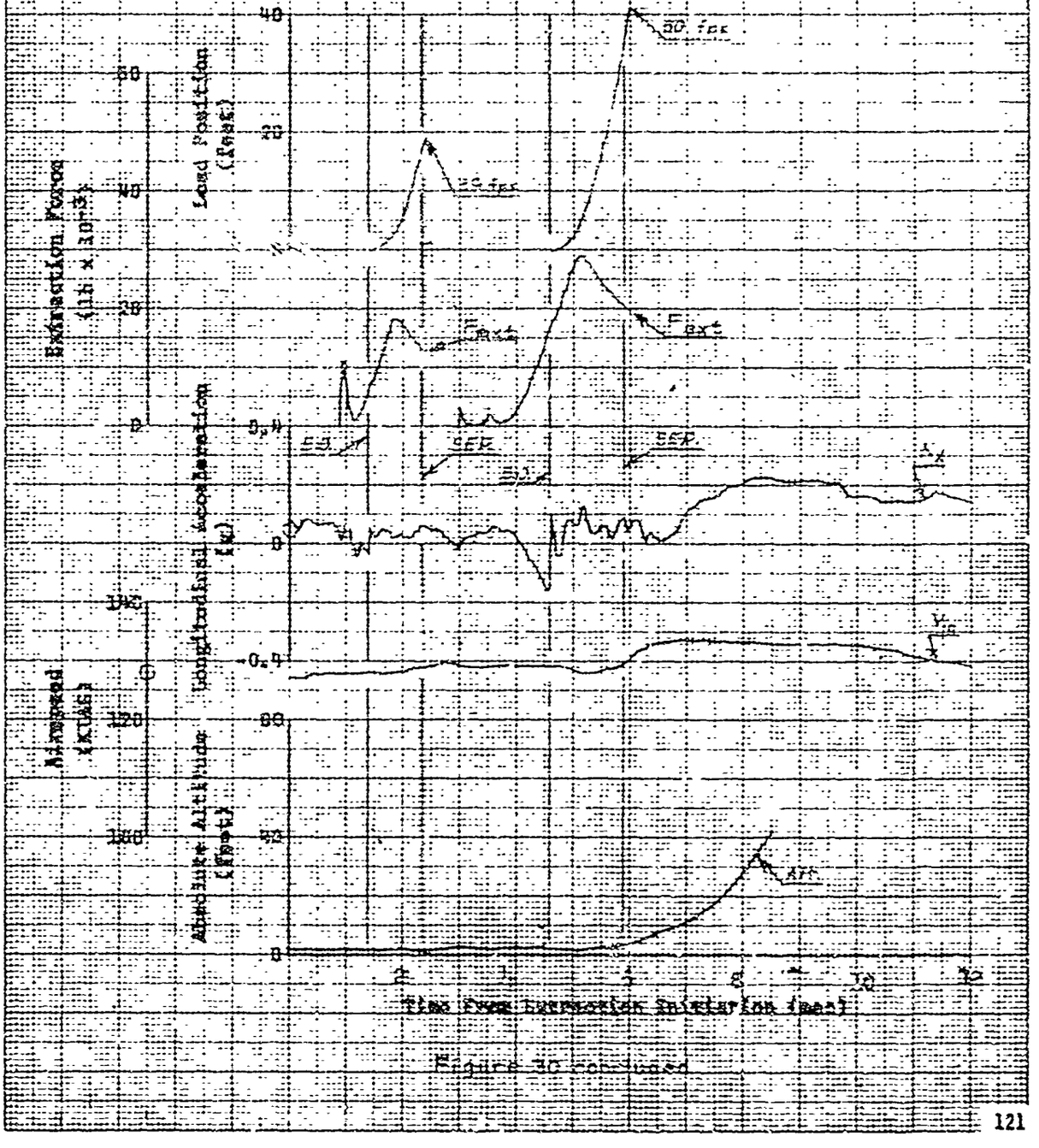


Figure 30 continued

C-12VC USAF S/N 64-14580
A/A32H-4 Rail System
Extraction Number 21

Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (pct MAC)	Airplane cg After Extraction (pct MAC)	Load Weight (lb)	Flap Position (pct)	Elevator Trim Tab Position (deg)
103 300	24.5	24.4	12 200	50	3 ANU

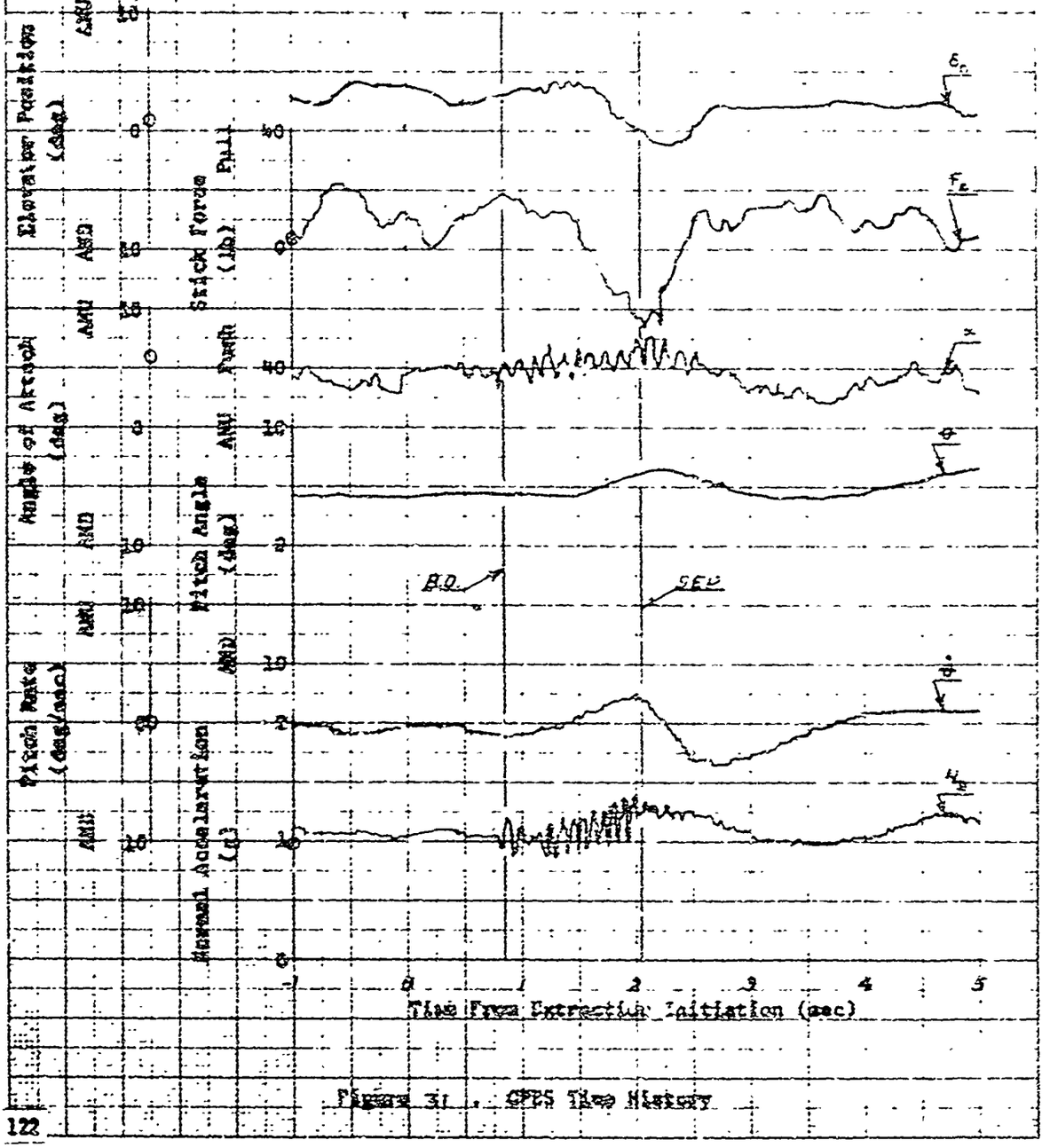


Figure 31. CPES Time History

NOTE: 1. Symbols denote trim values.

2. TIME ZERO IS MANUAL EVENT TAKEN AS PILOT CROSSES OVER ARRESTOR CABLE.

TURBULENCE WAS LIGHT.

Pressure Altitude (Ft)	Outside Air Temp (deg)	Headwind Component + headwind (knots)	Crosswind Component + from right (knots)
-100	39 F	-4	0

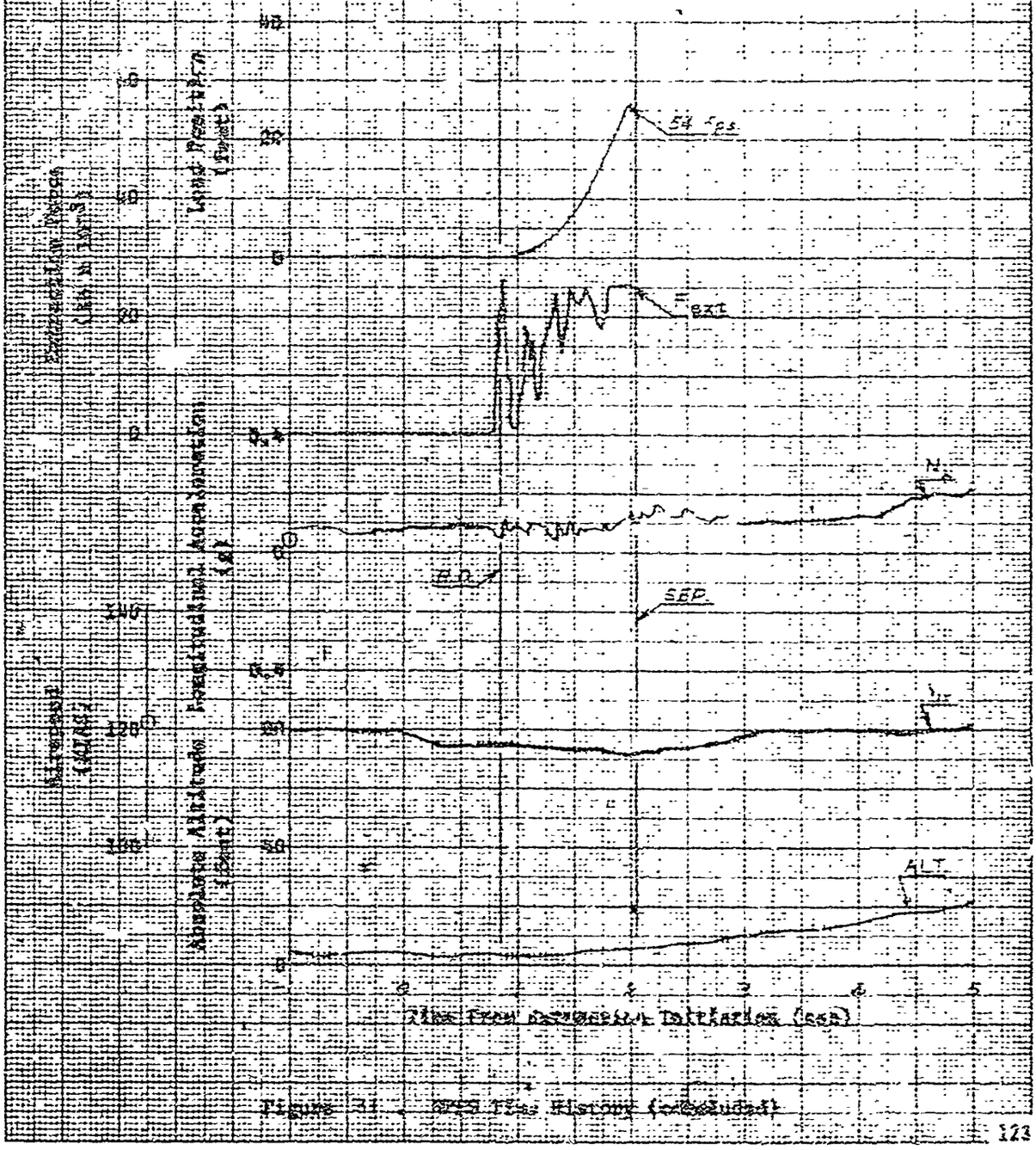


Figure 31. Open Time History (concluded)

C-130E USAF S/N 64-0517
A/A32H-4 Rail System
Extraction Number 22

Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (pct MAC)	Airplane cg After Extraction (pct MAC)	Load Weight (lb)	Flap Position (pct)	Elevator Trim Tab Position (deg)
102 900	25.5	25.5	6250	50	2 ANU

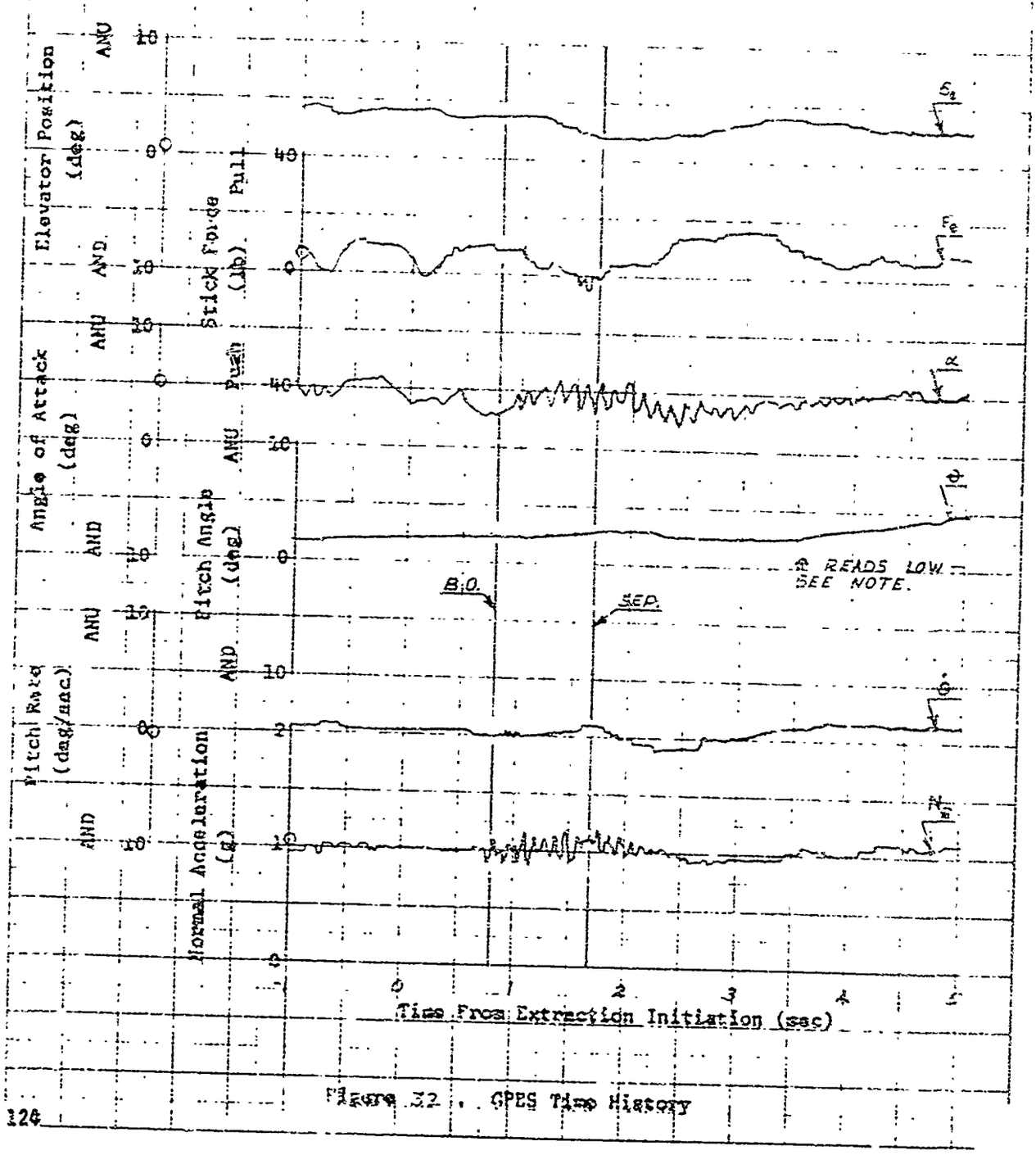


Figure 32. GPES Time History

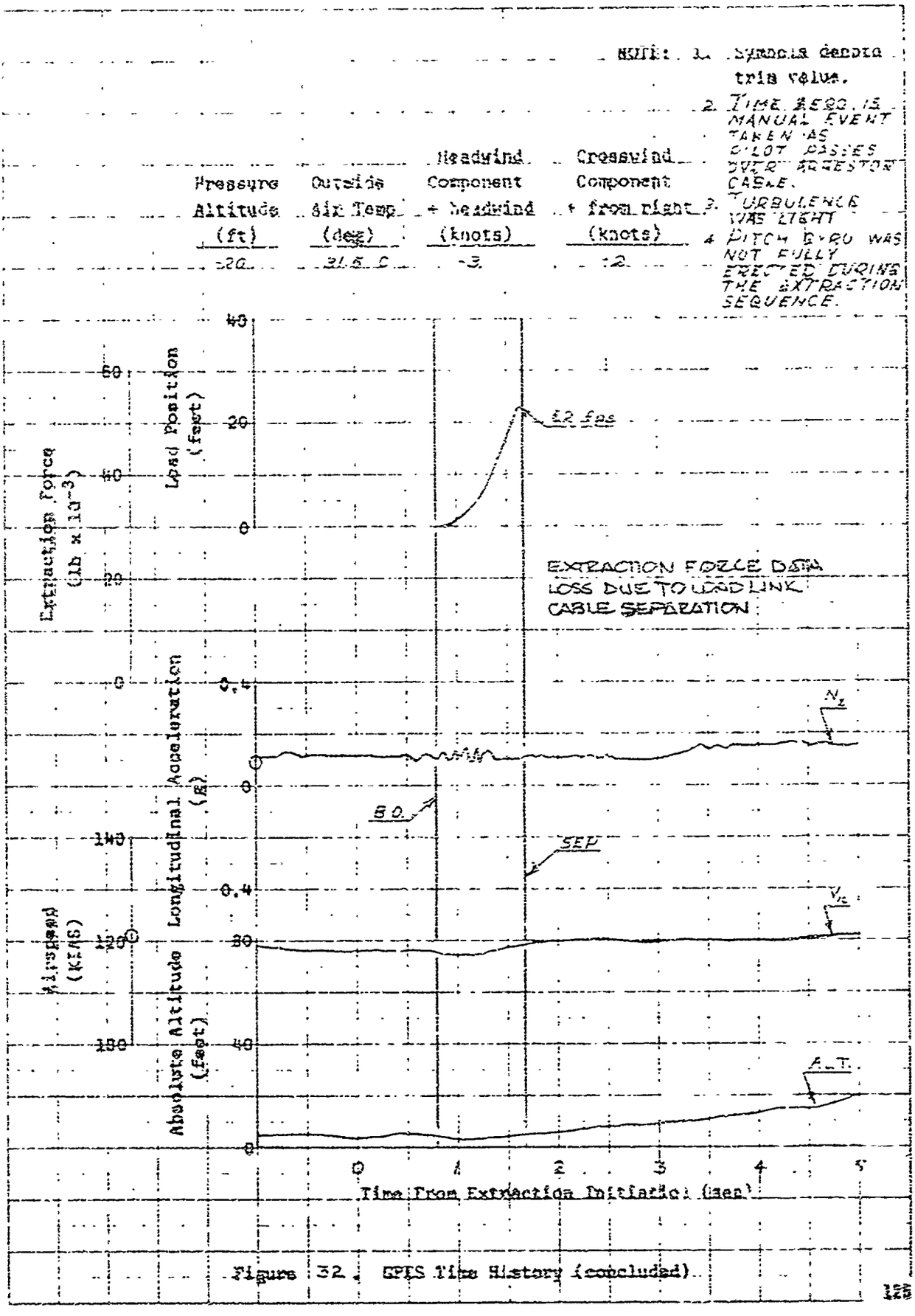


Figure 32. GPES Time History (concluded)

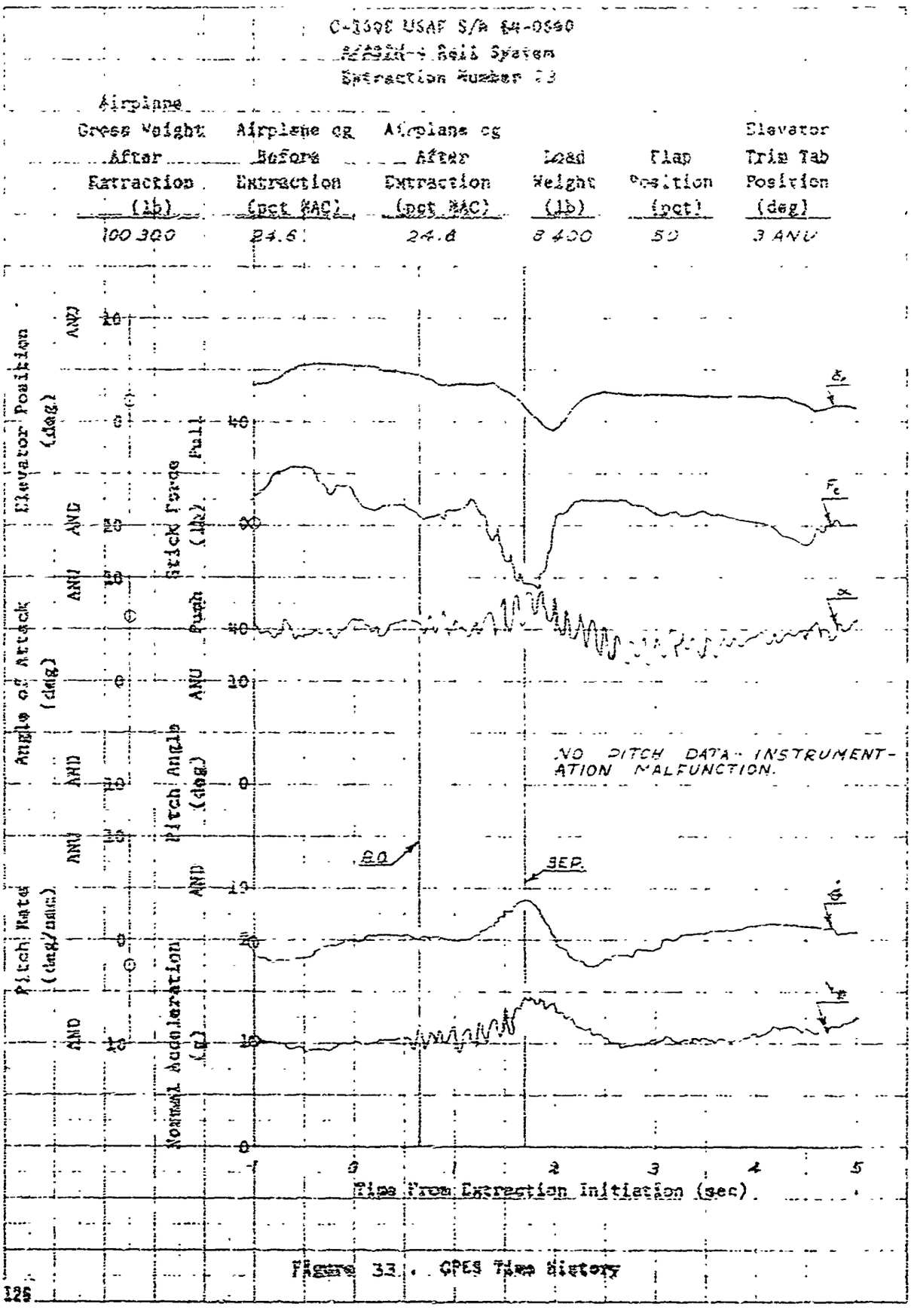


Figure 33. CPES Time History

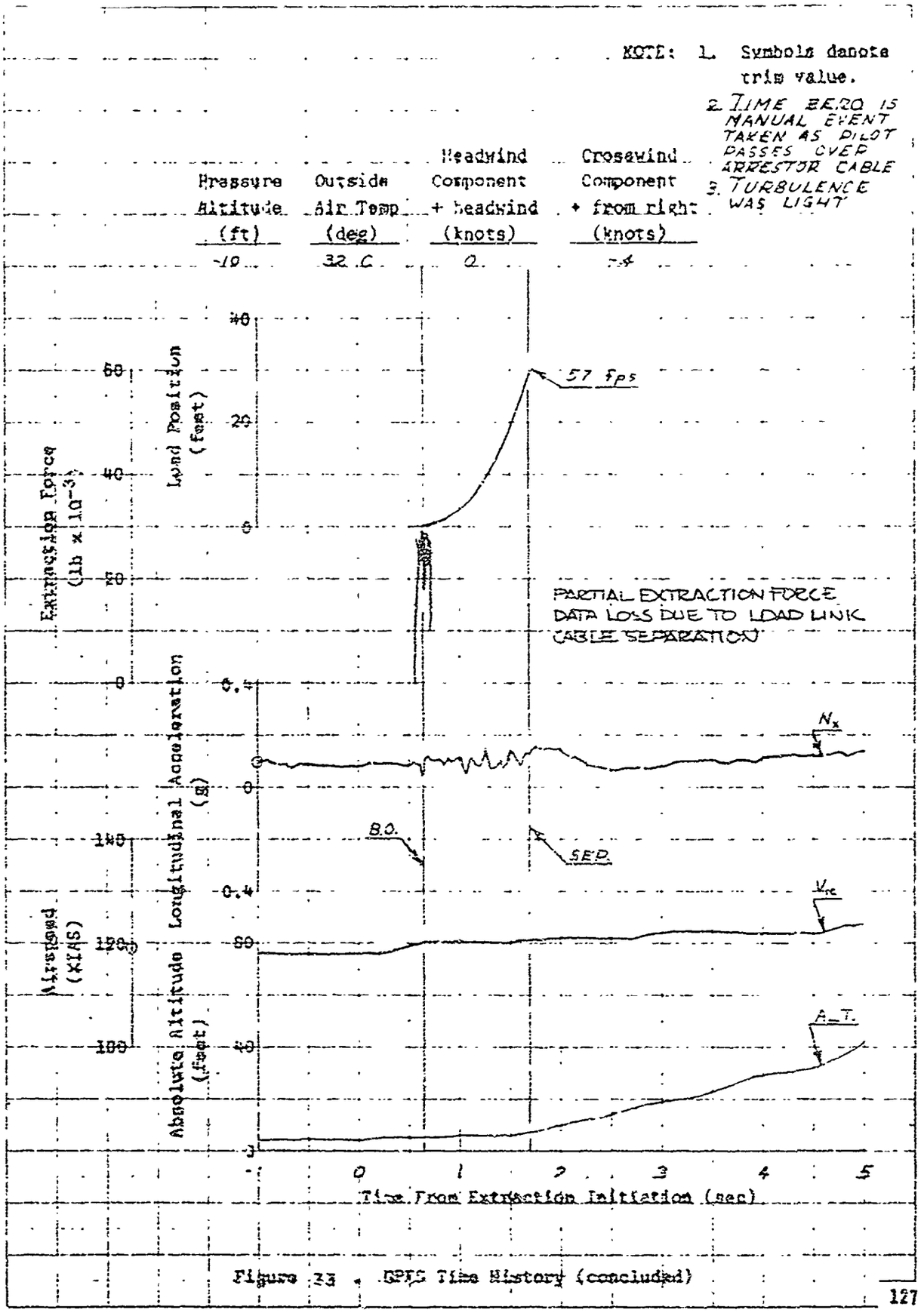


Figure 23 . GPES Time History (concluded)

C-17? USAF S/N [illegible]
A/A32A-4 Rail System
Extraction Number 24

Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (pct MAC)	Airplane cg After Extraction (pct MAC)	Load Weight (lb)	Flap Position (pct)	Elevator Trim Tab Position (deg)
101 500	24.6	-.8	25000	50	4 ANU

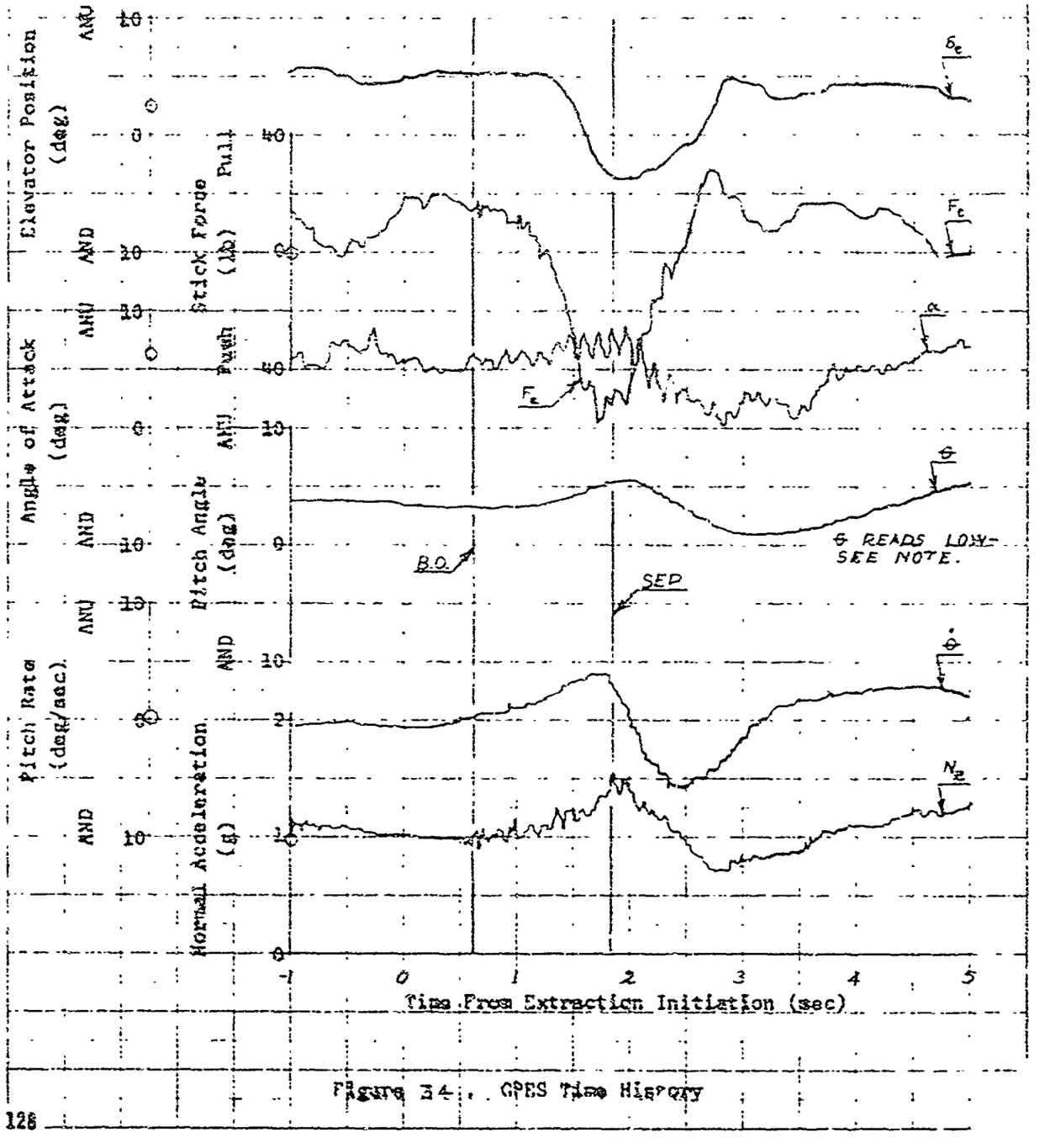
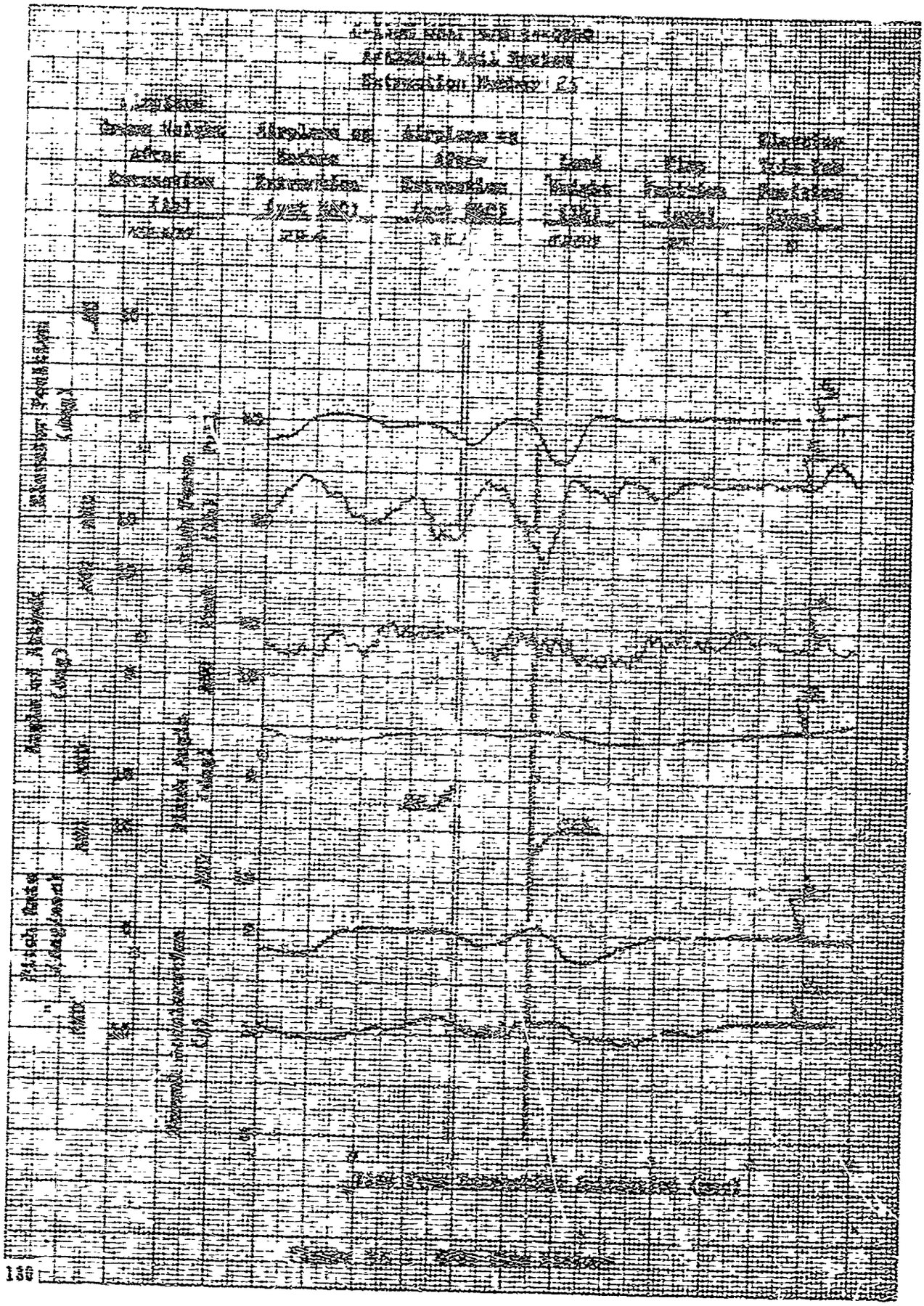


Figure 34. CPES Time History



NOTE: 1. Symbols denote trim value.
2. TIME ZERO IS MANUAL EVENT TAKEN AS PILOT PASSES OVER ARRESTOR CABLE
3. TURBULENCE WAS LIGHT

Pressure Altitude (ft)	Outside Air Temp (deg)	Headwind Component + headwind (knots)	Crosswind Component + from right (knots)
45	27.5 C	0	6

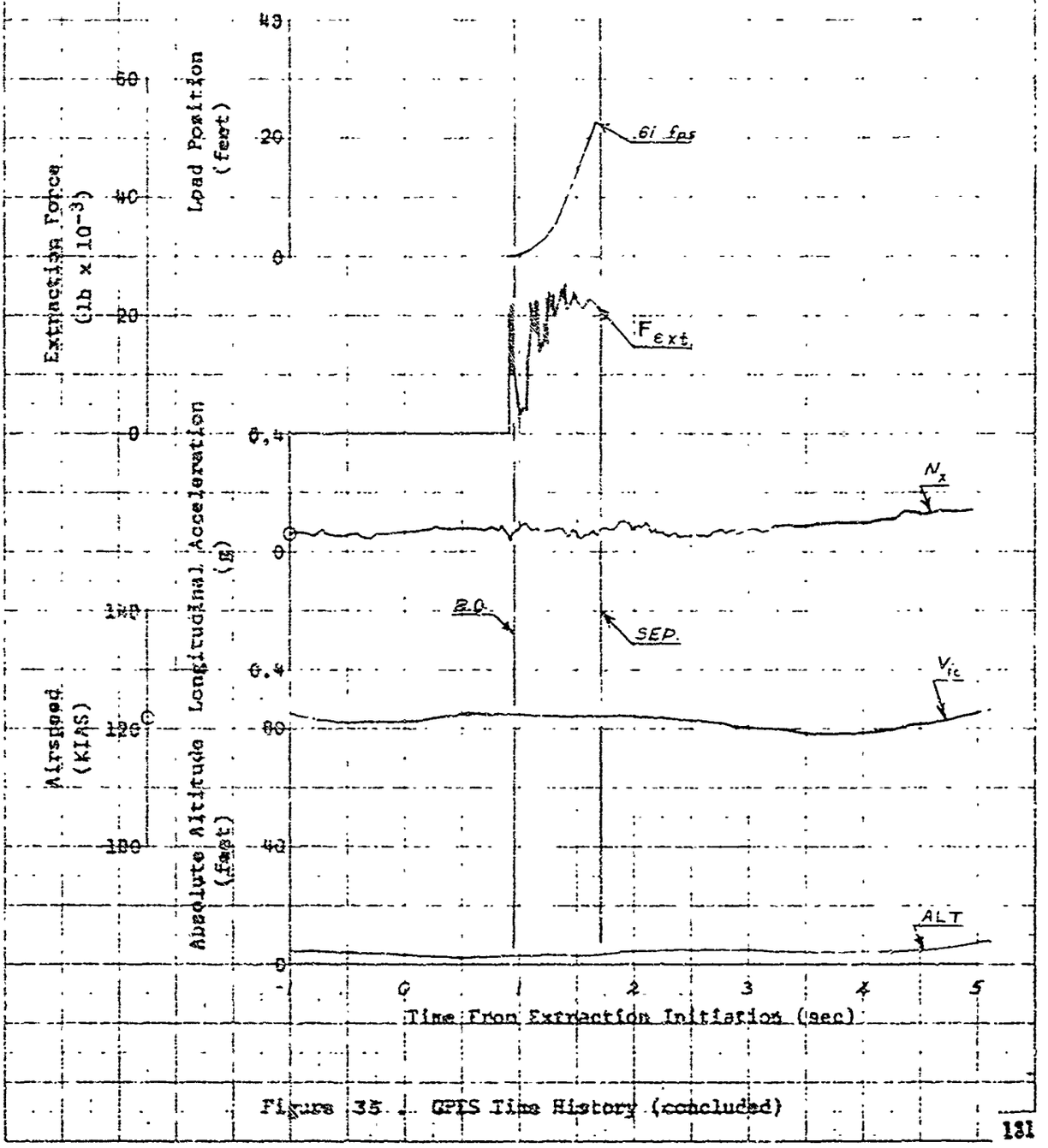


Figure 35. GPIS Time History (concluded)

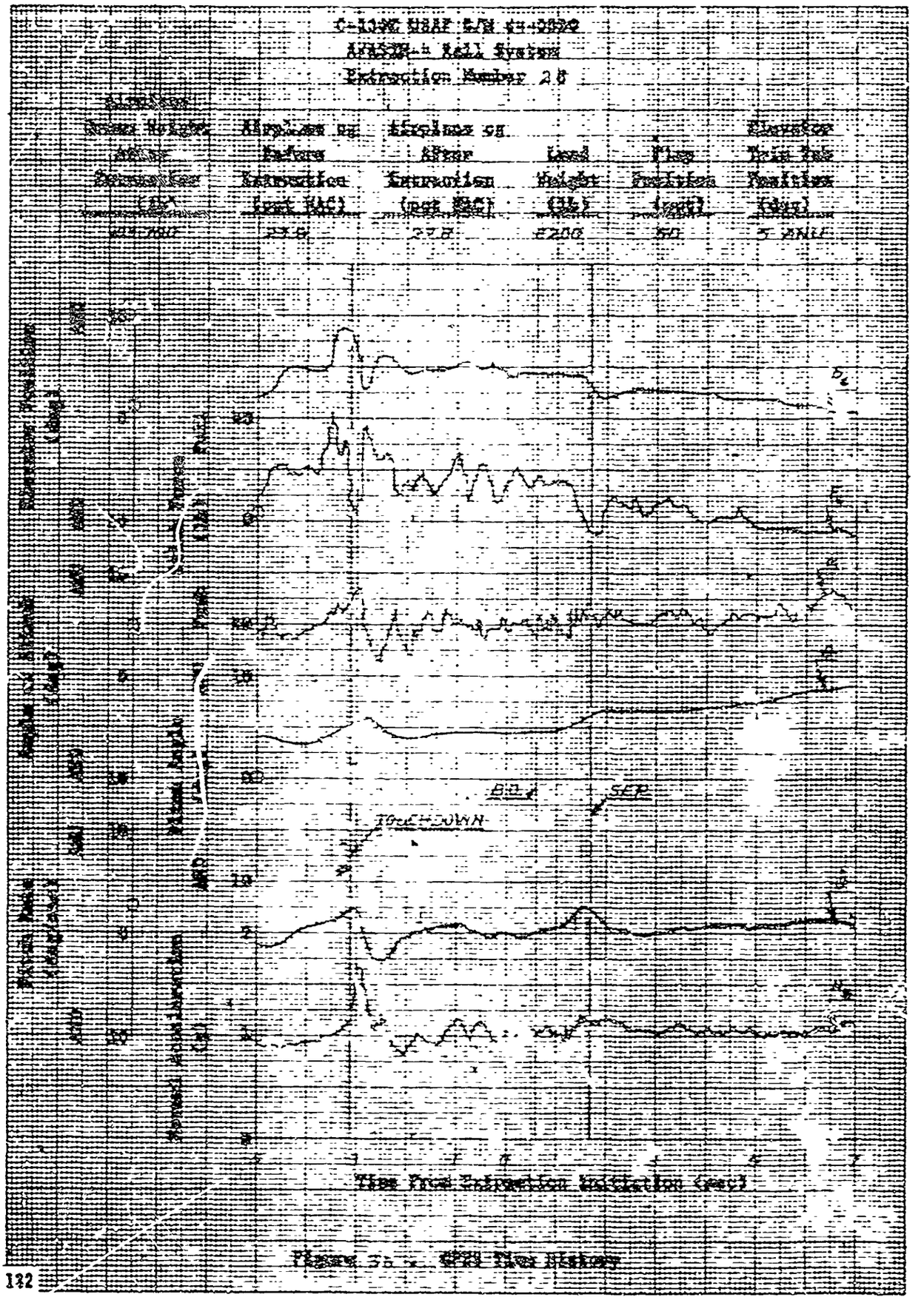


Figure 3b. C-130 Time History

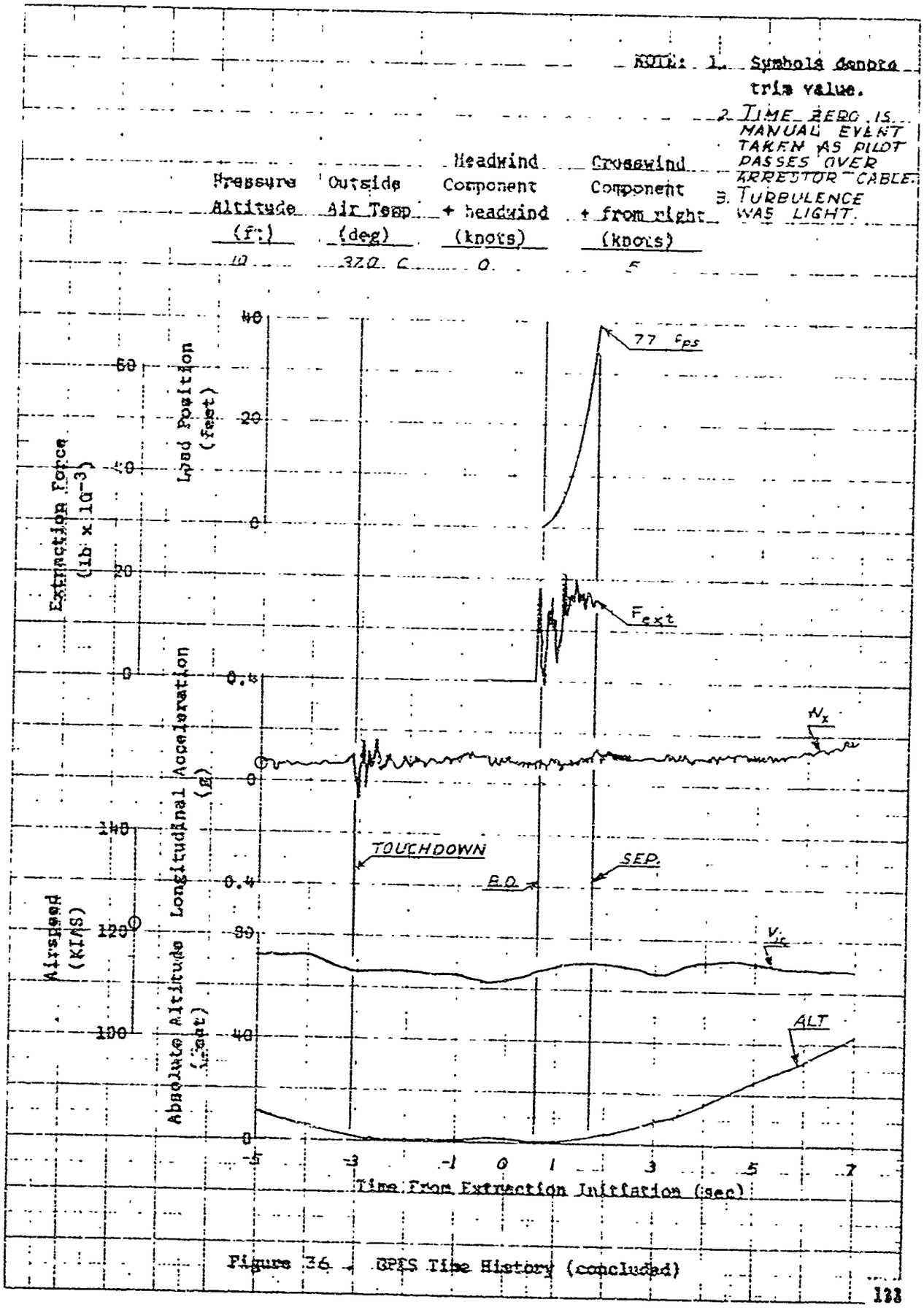


Figure 36 - GPES Time History (concluded)

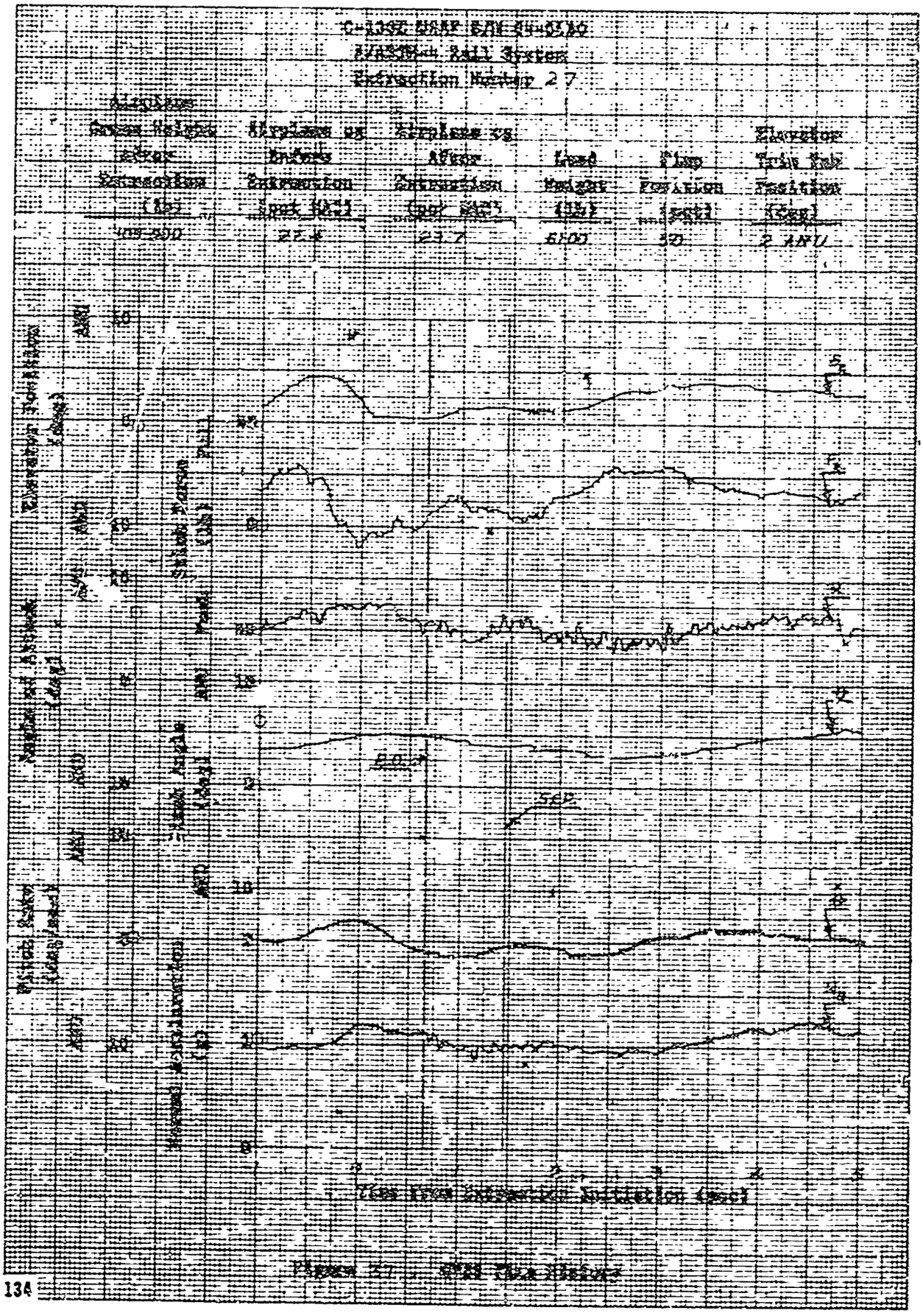
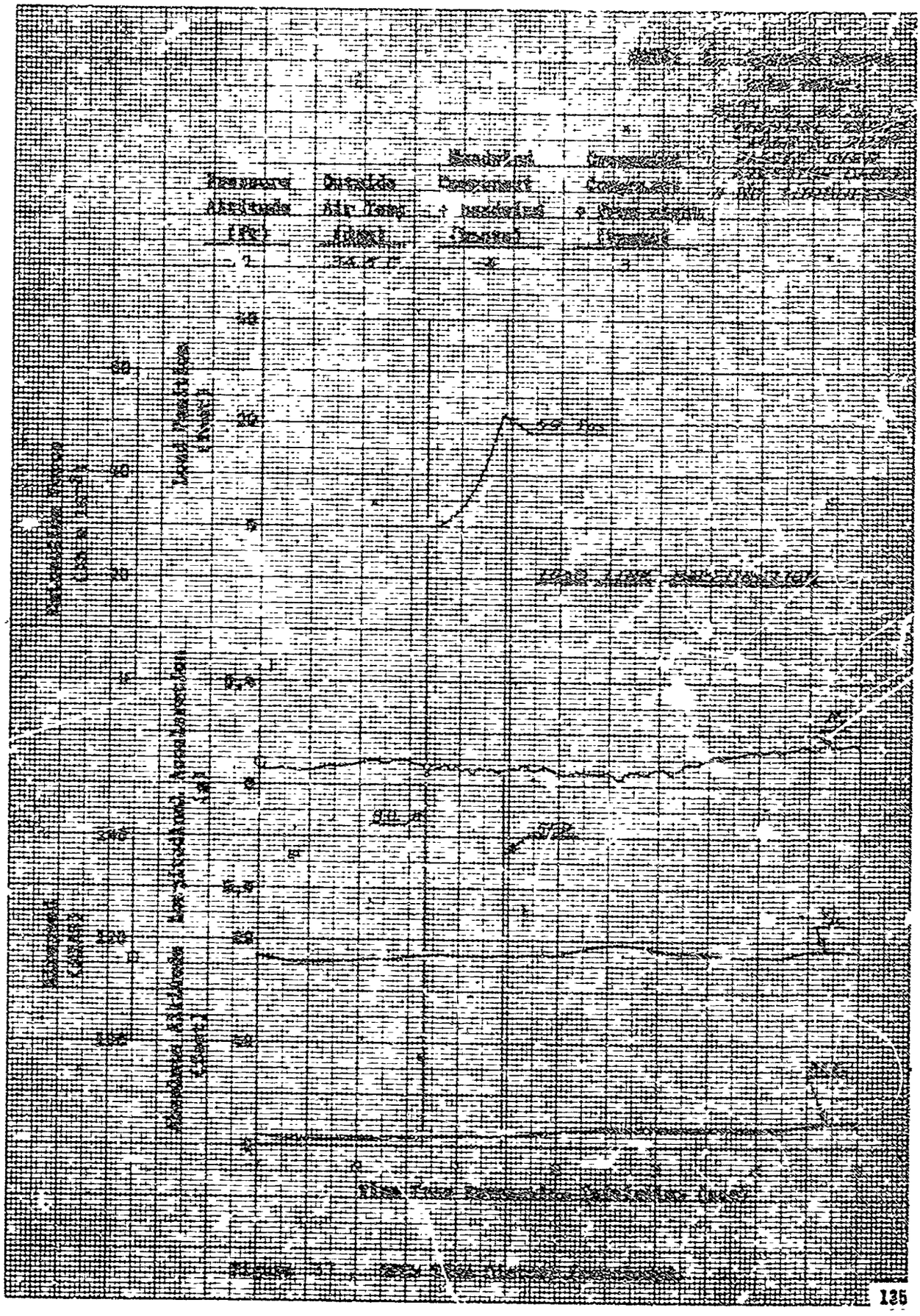
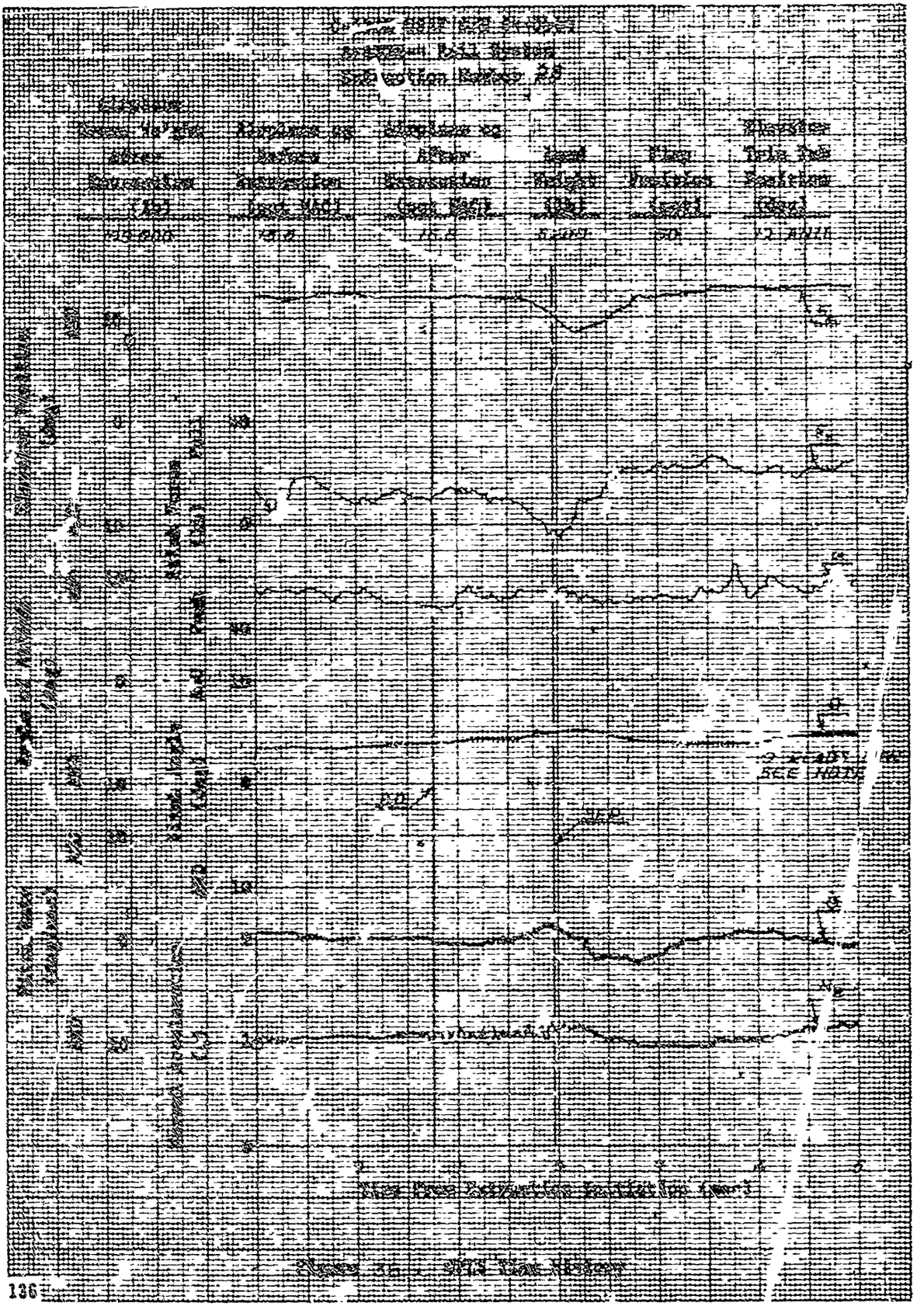
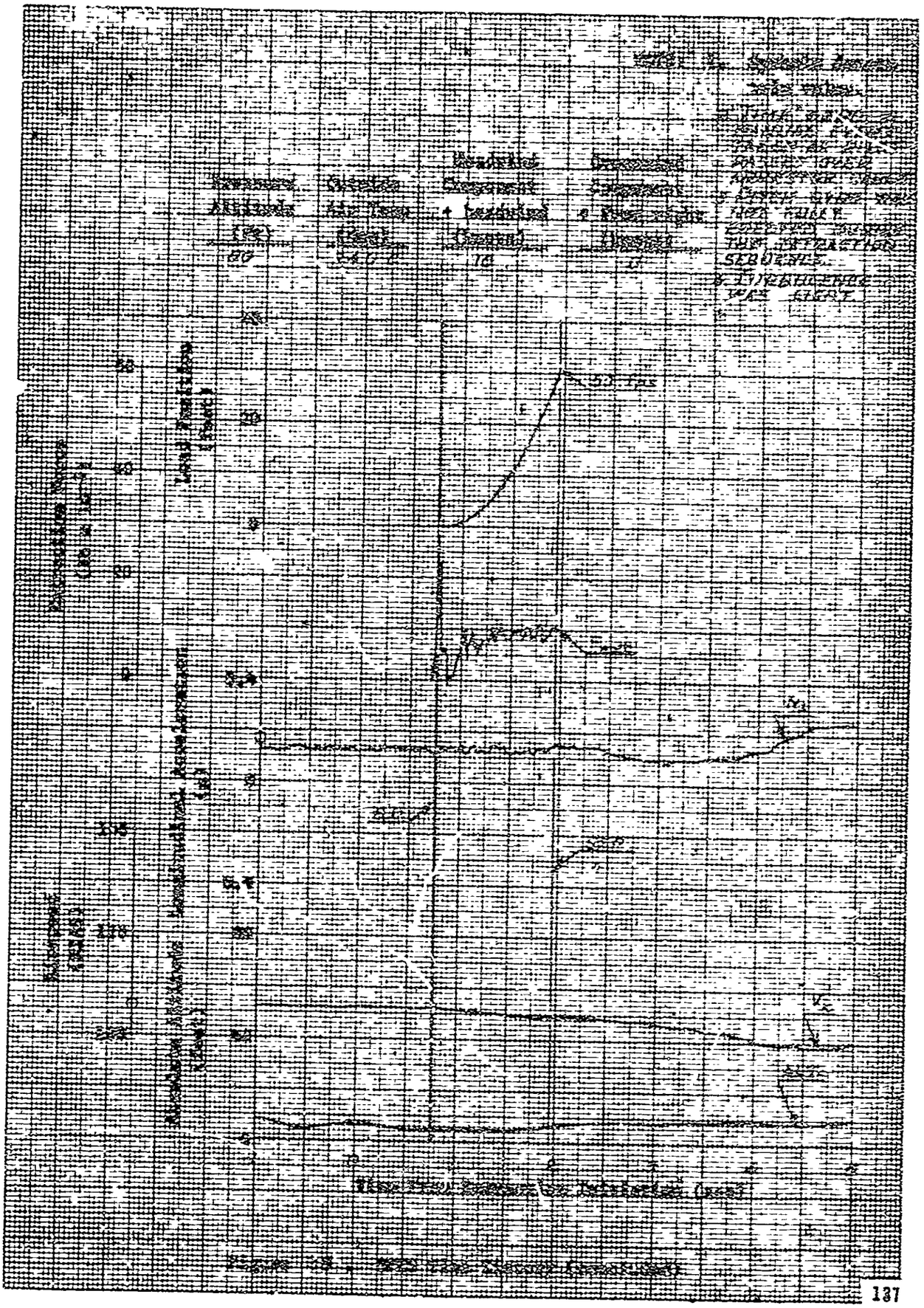
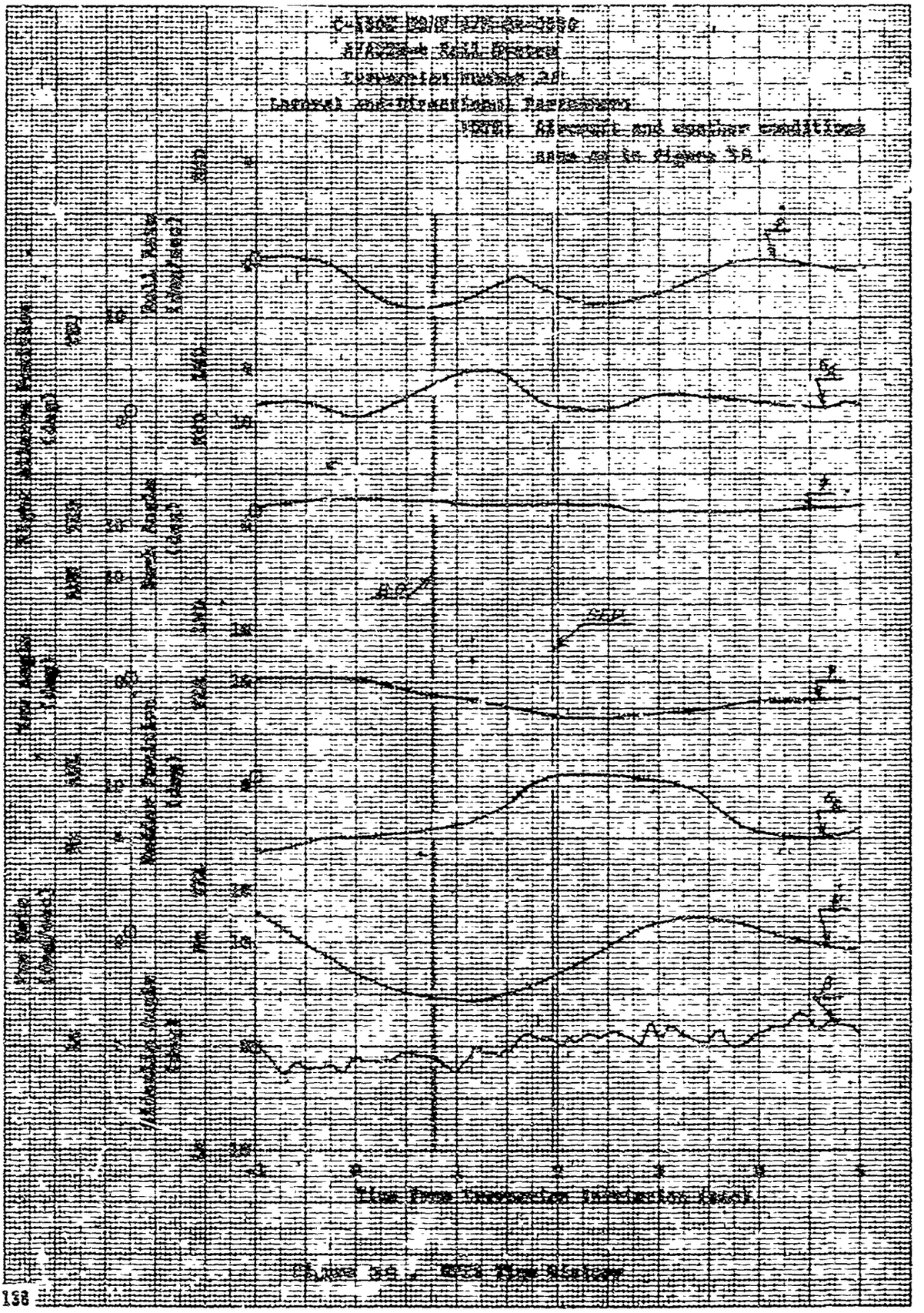


Figure 27. C-135E Test Results

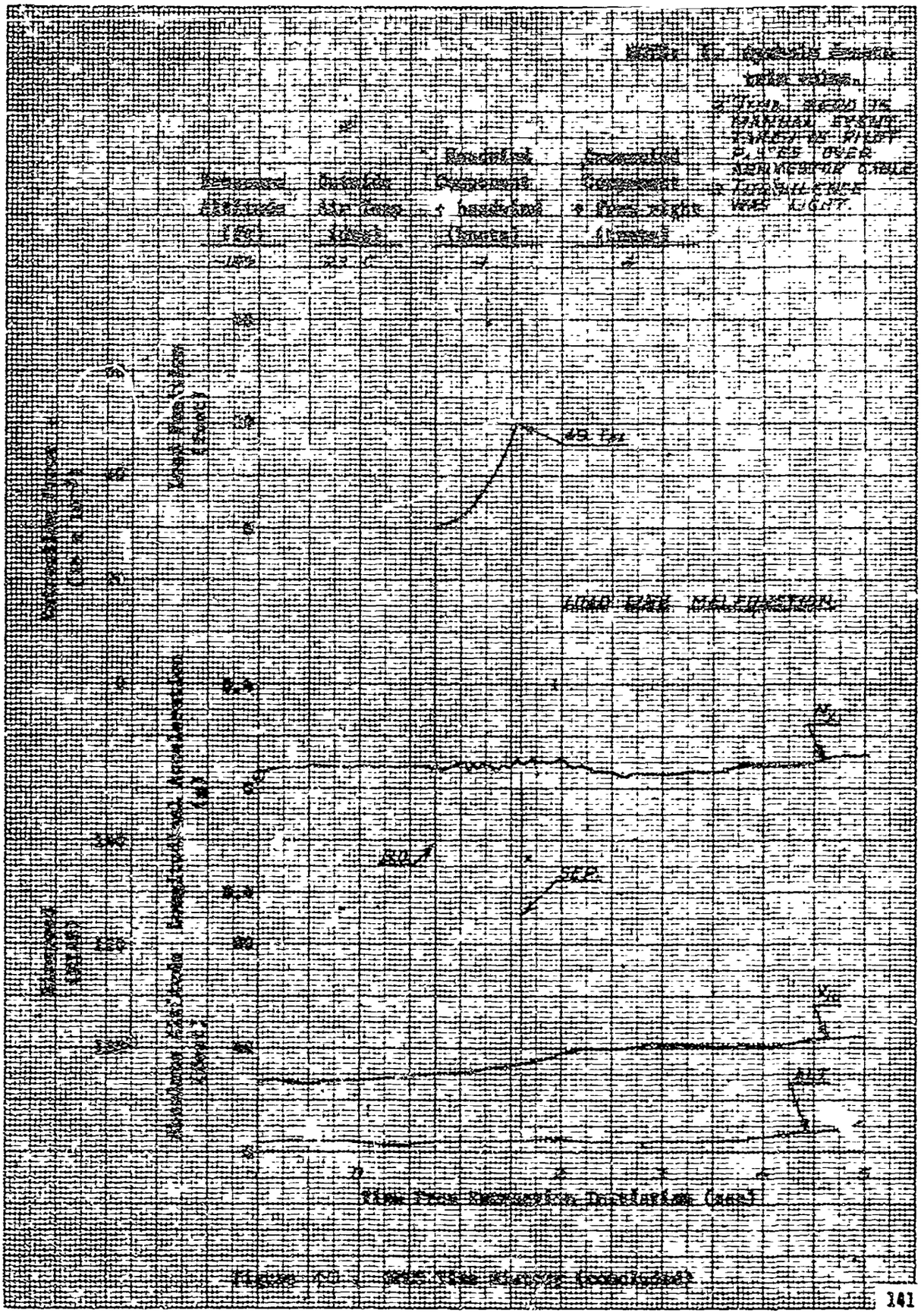








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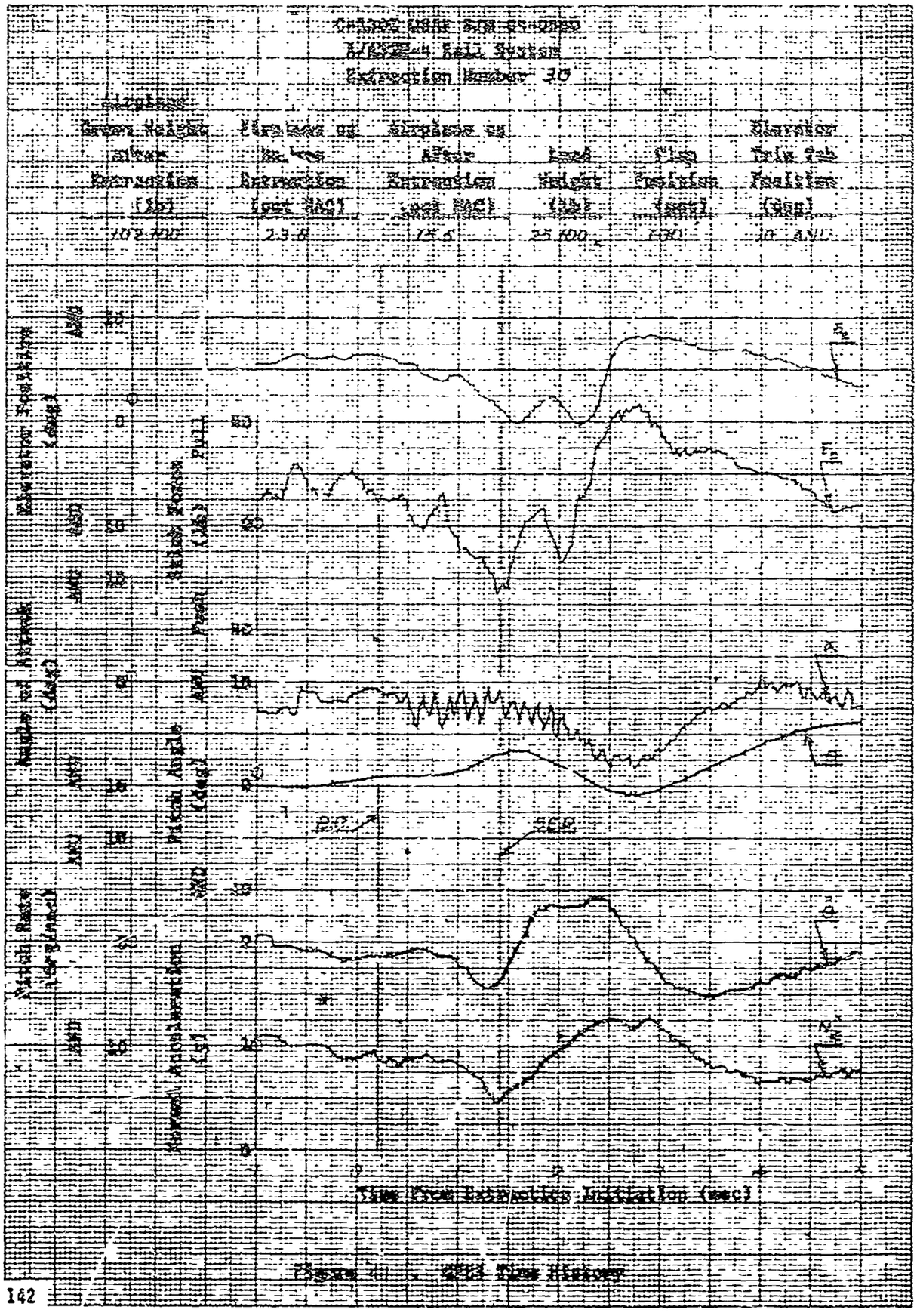
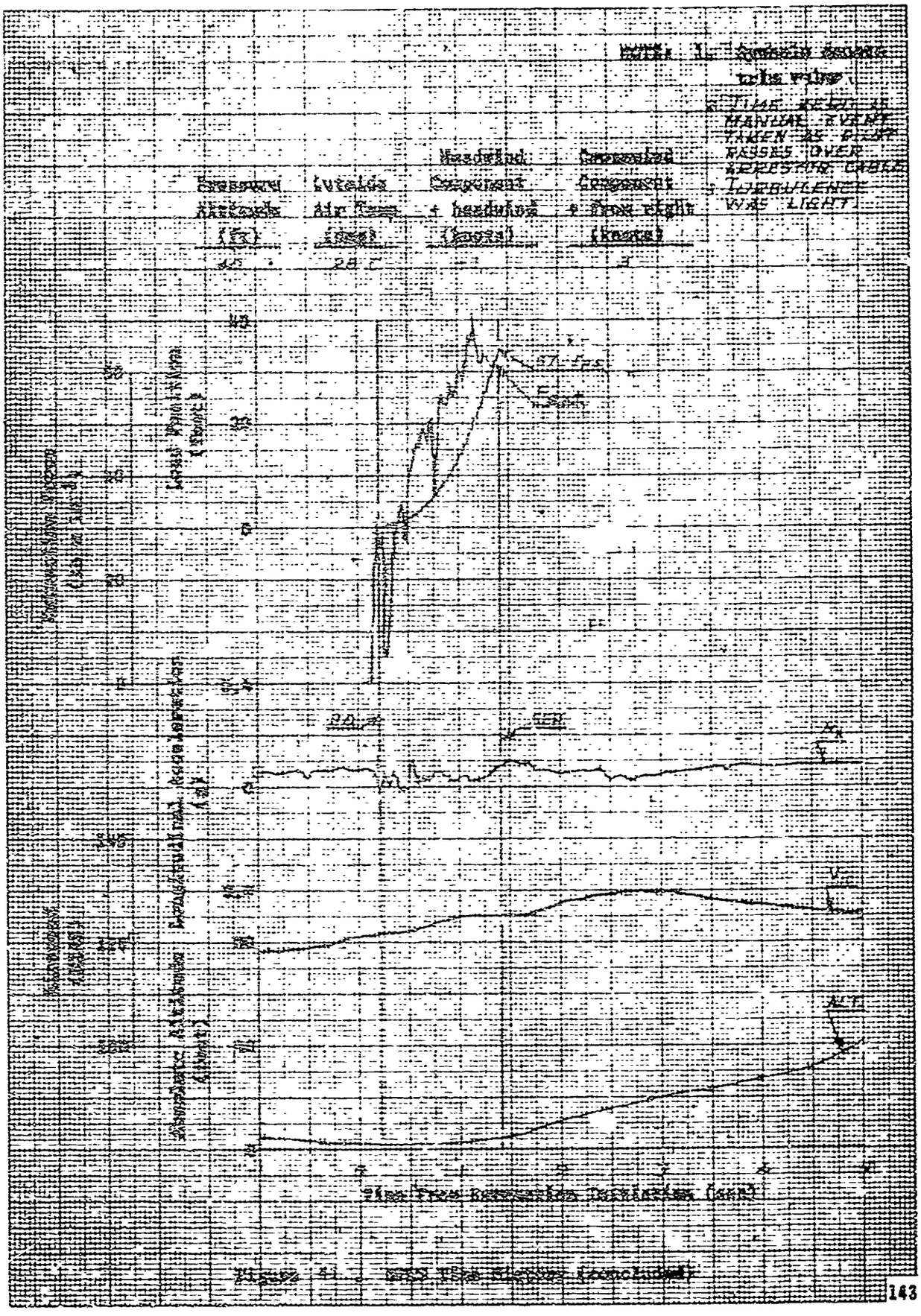
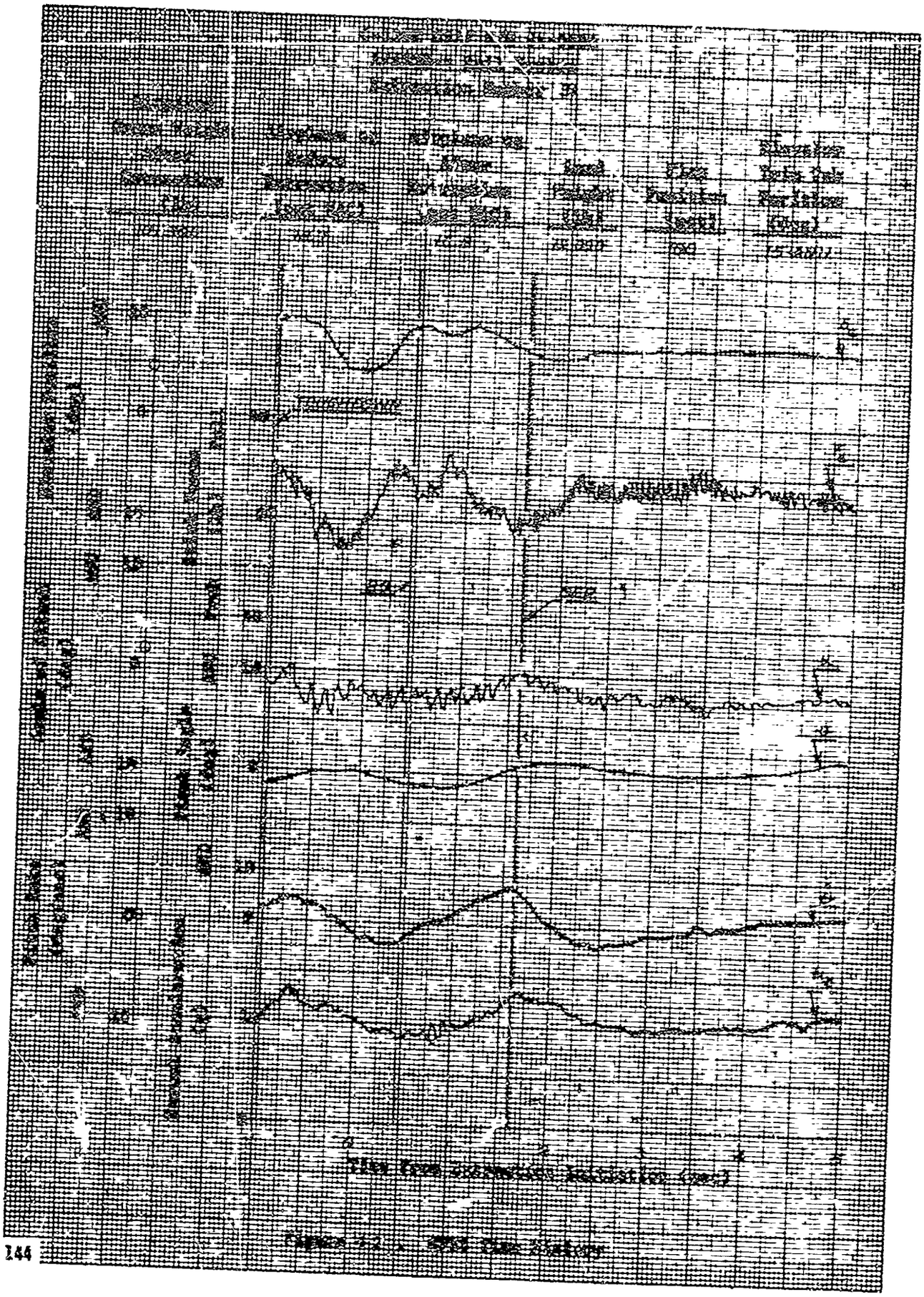
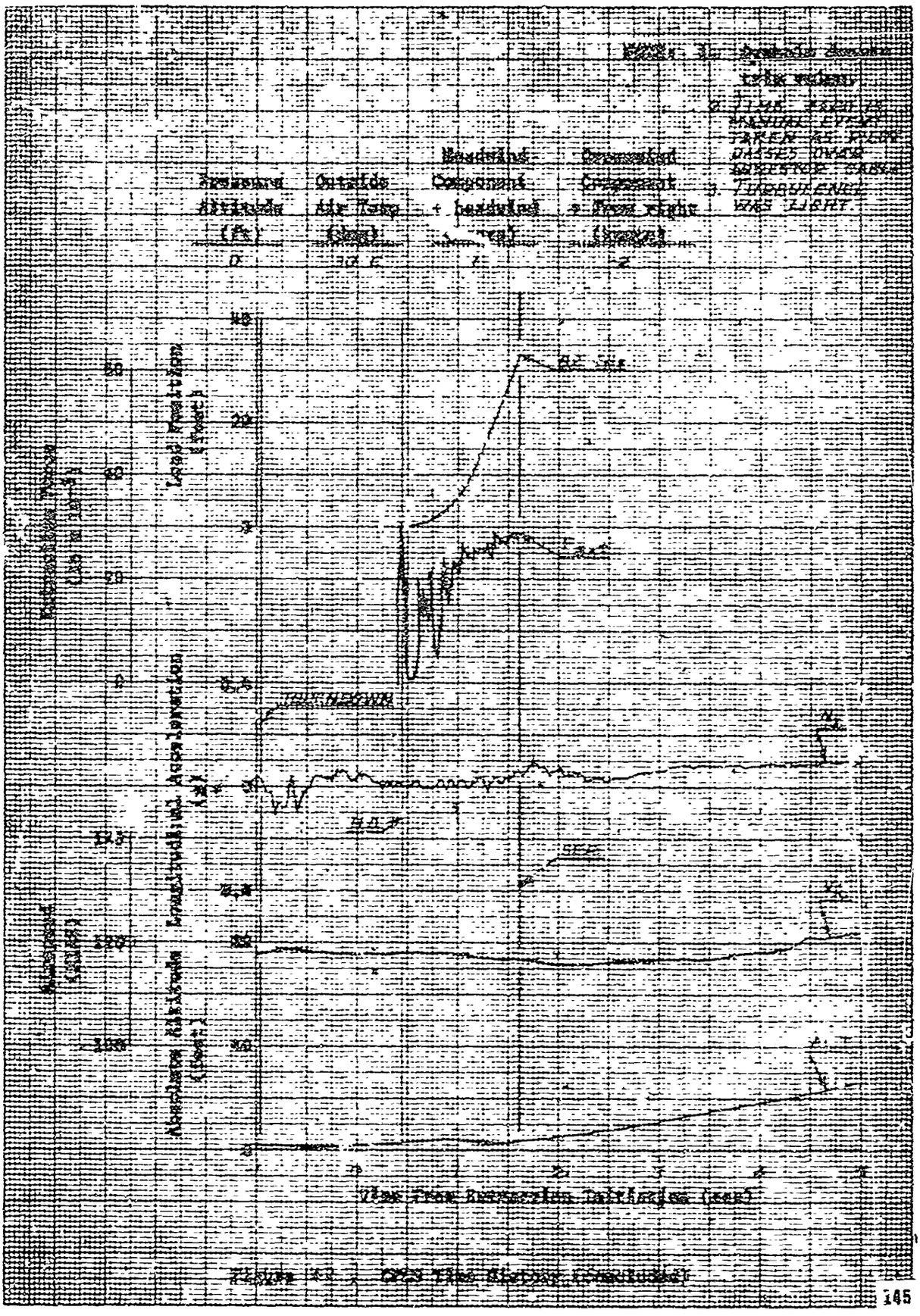
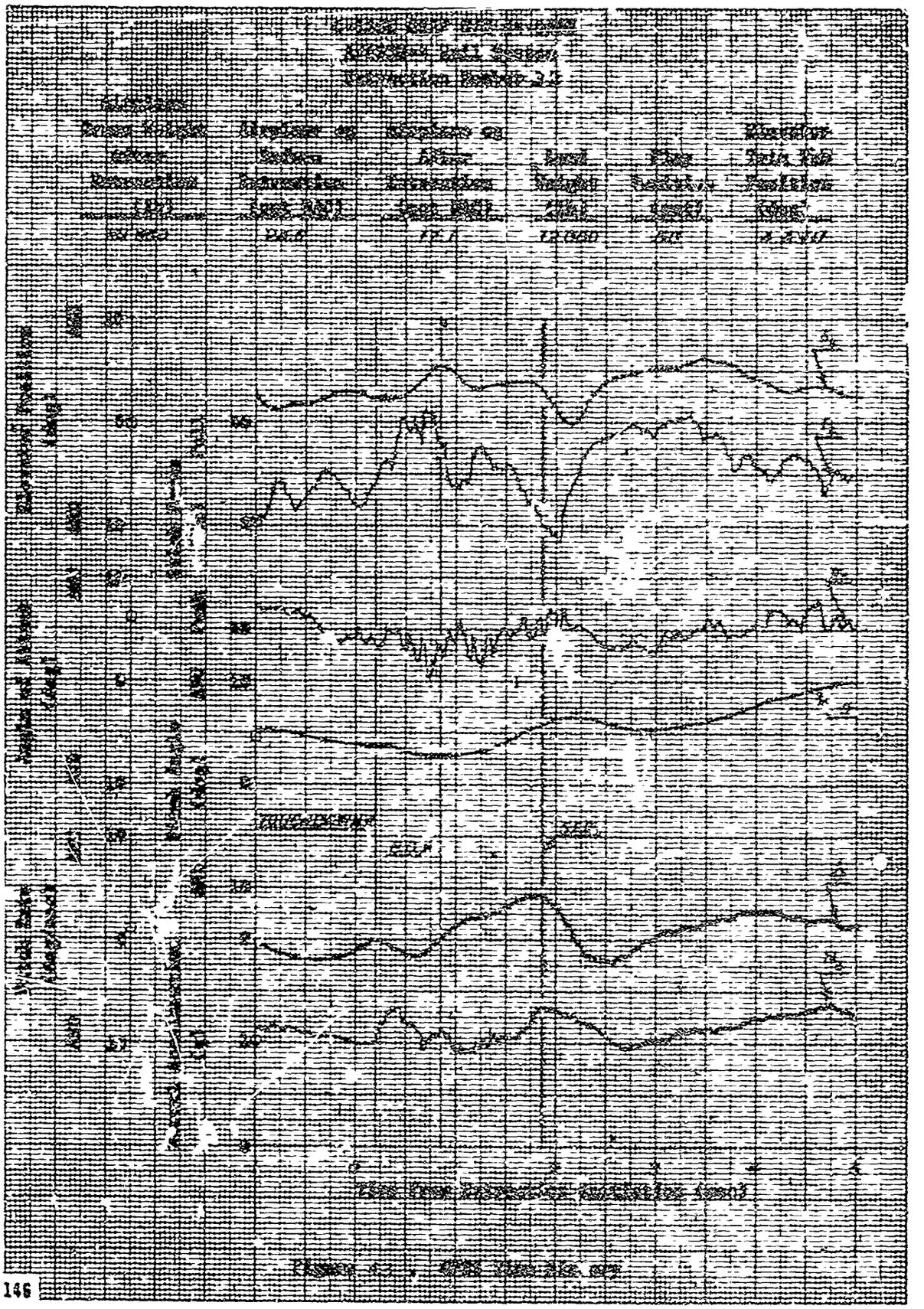


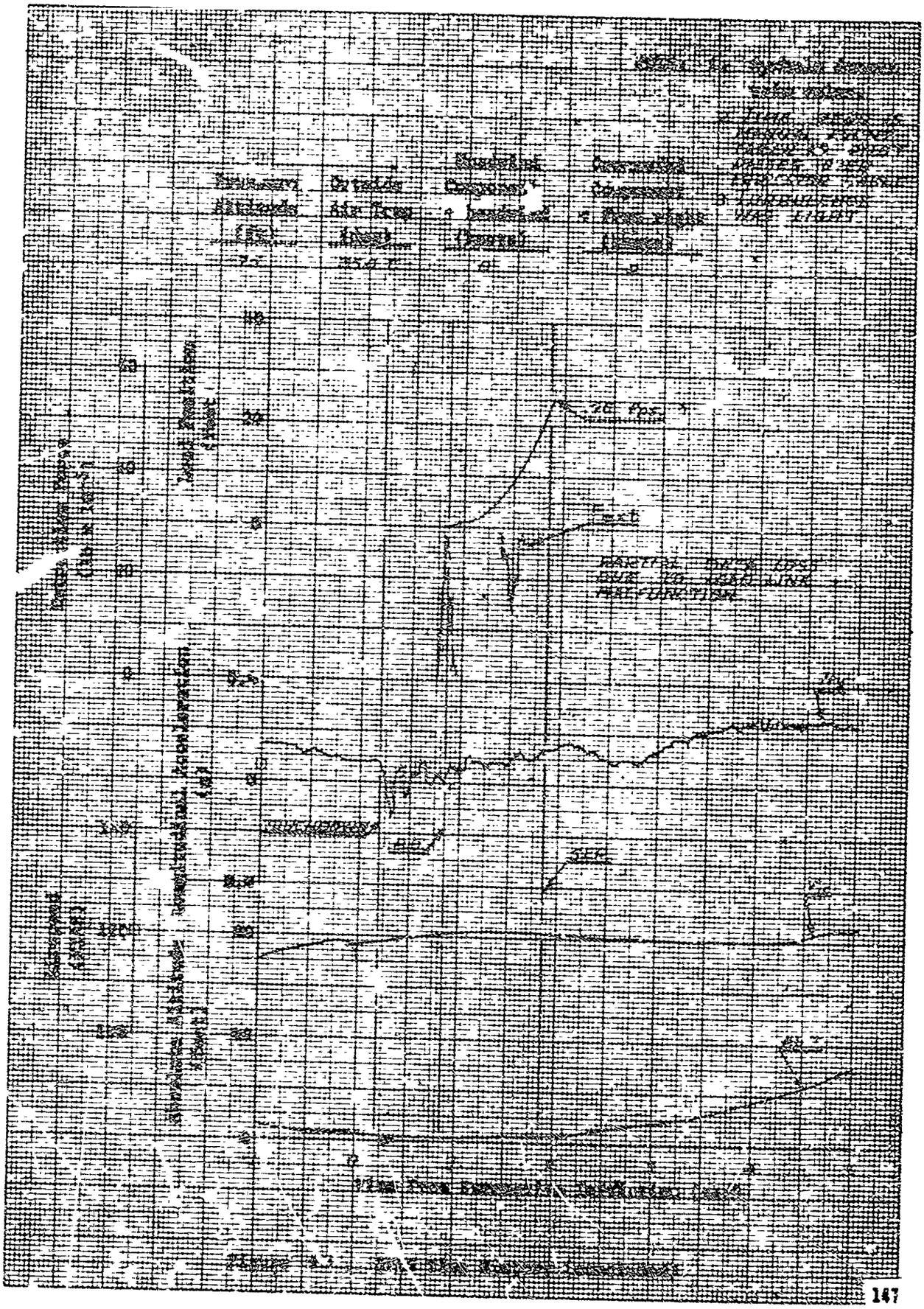
Figure 4. ACES Time History

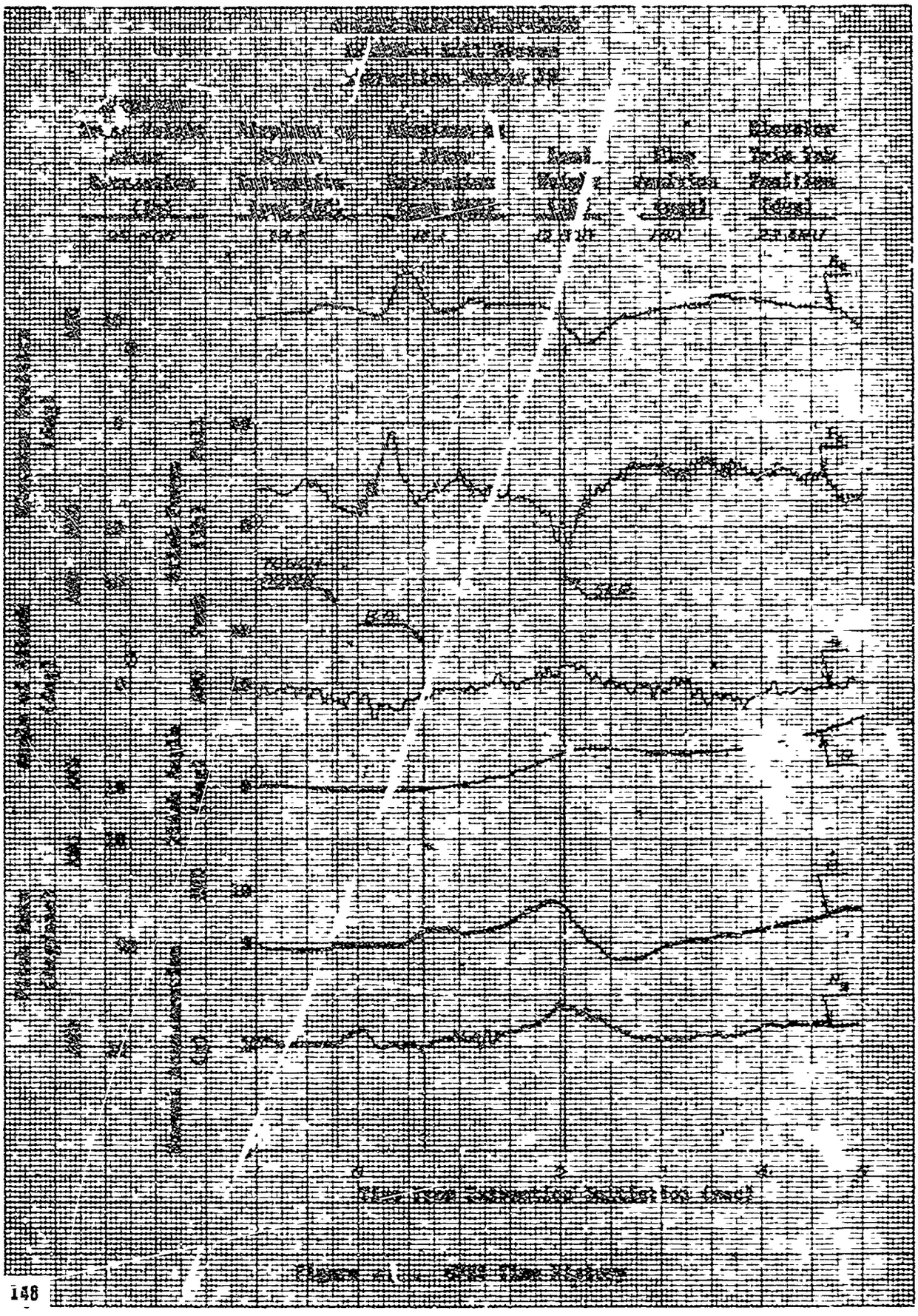












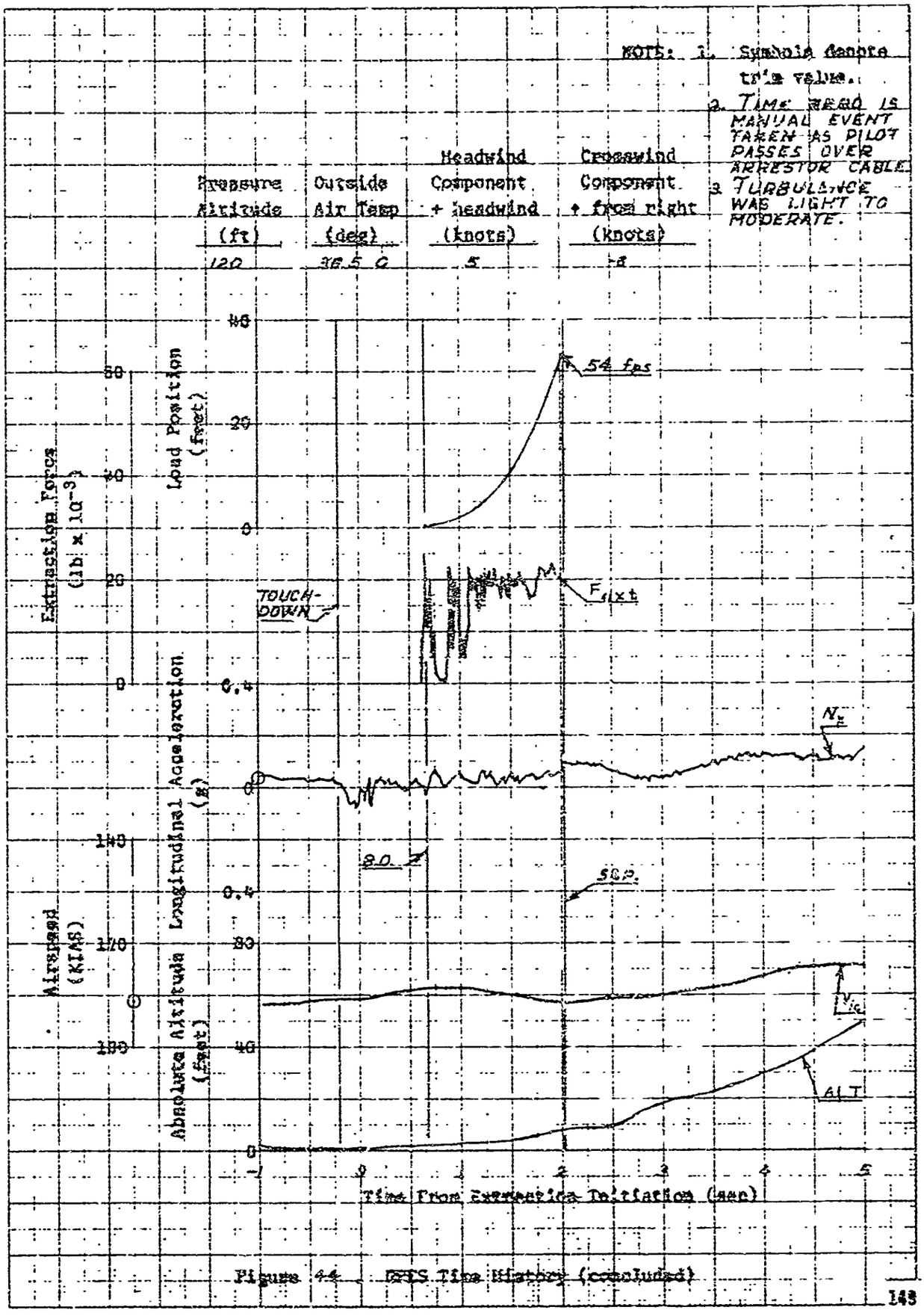
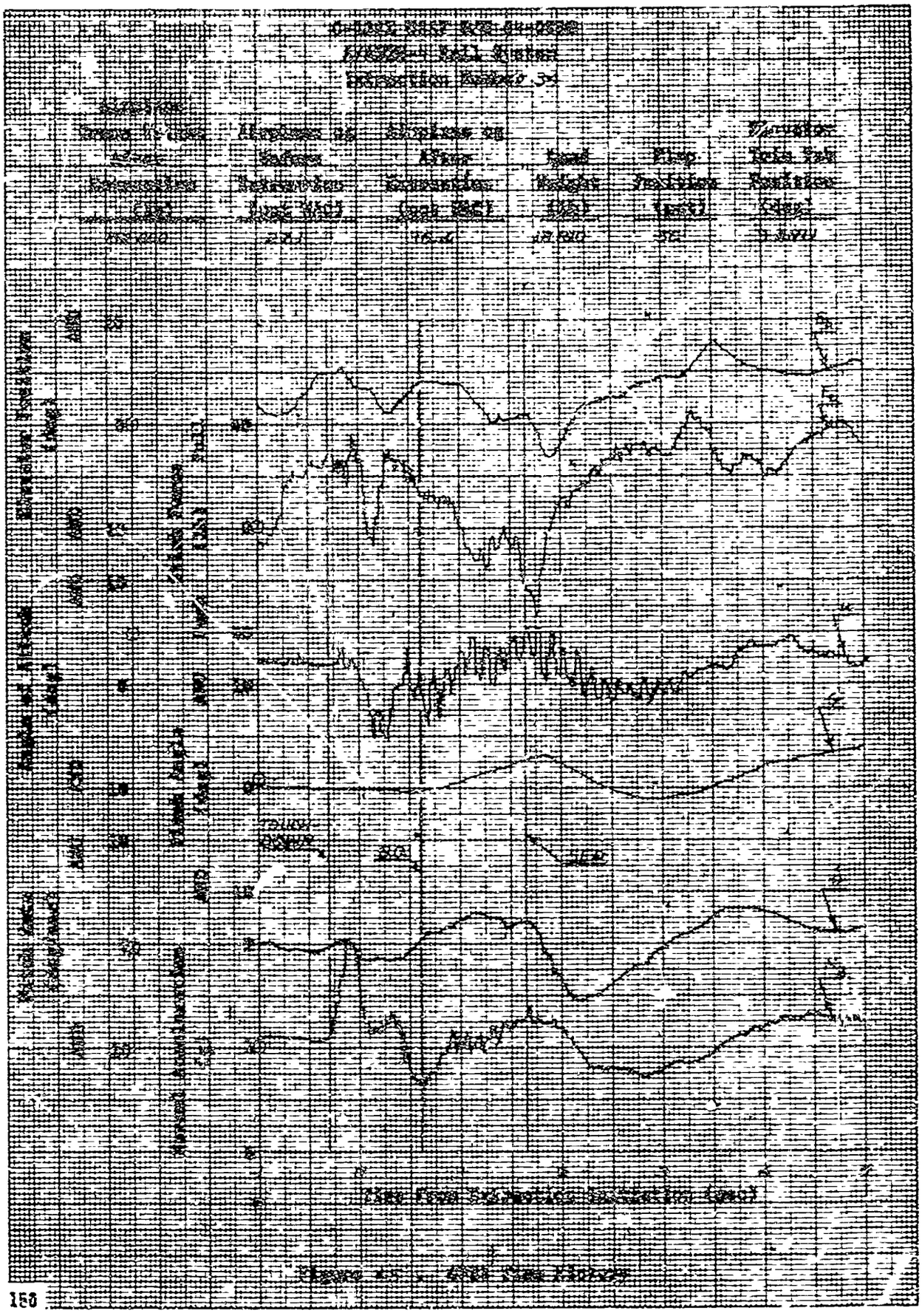
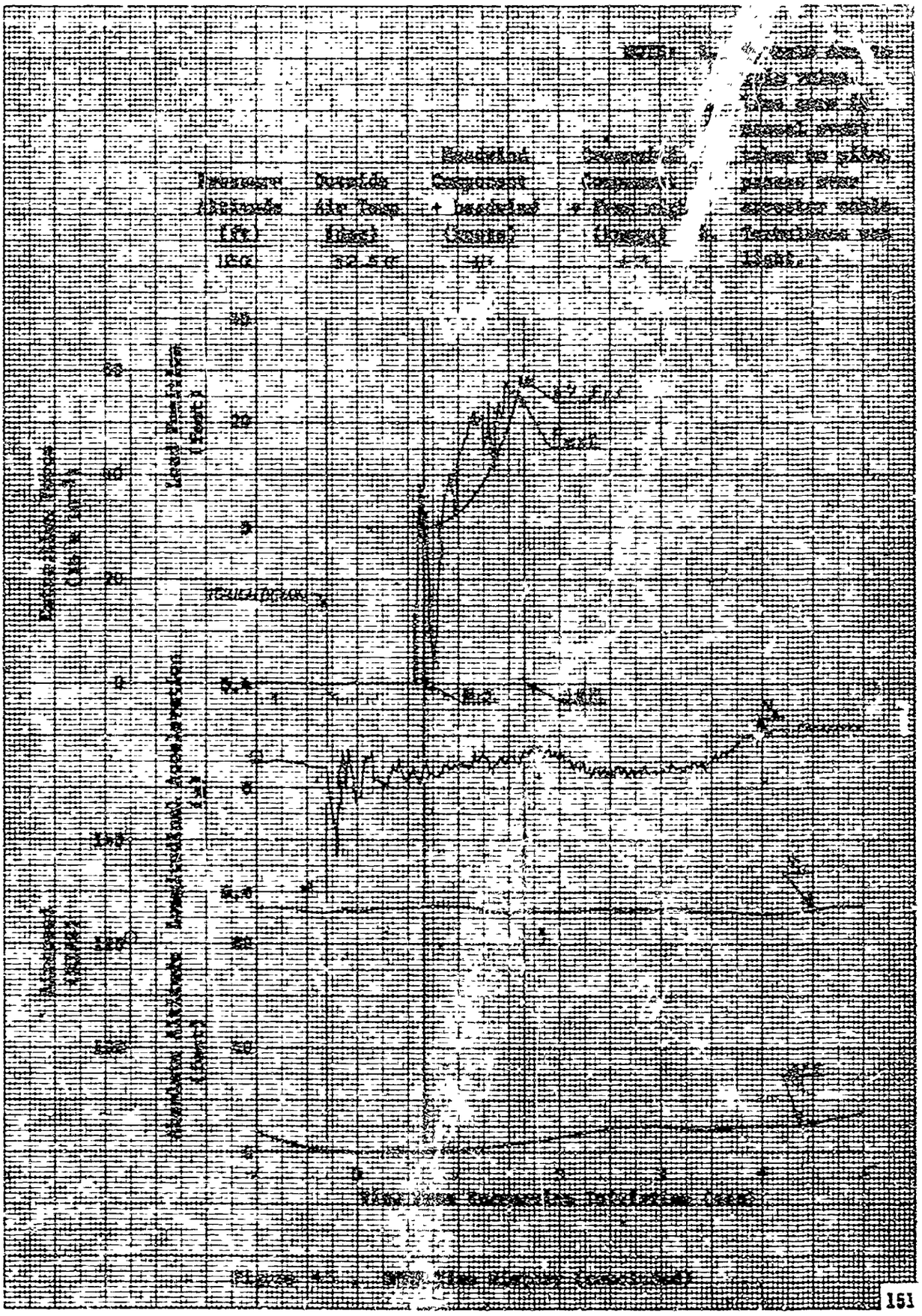
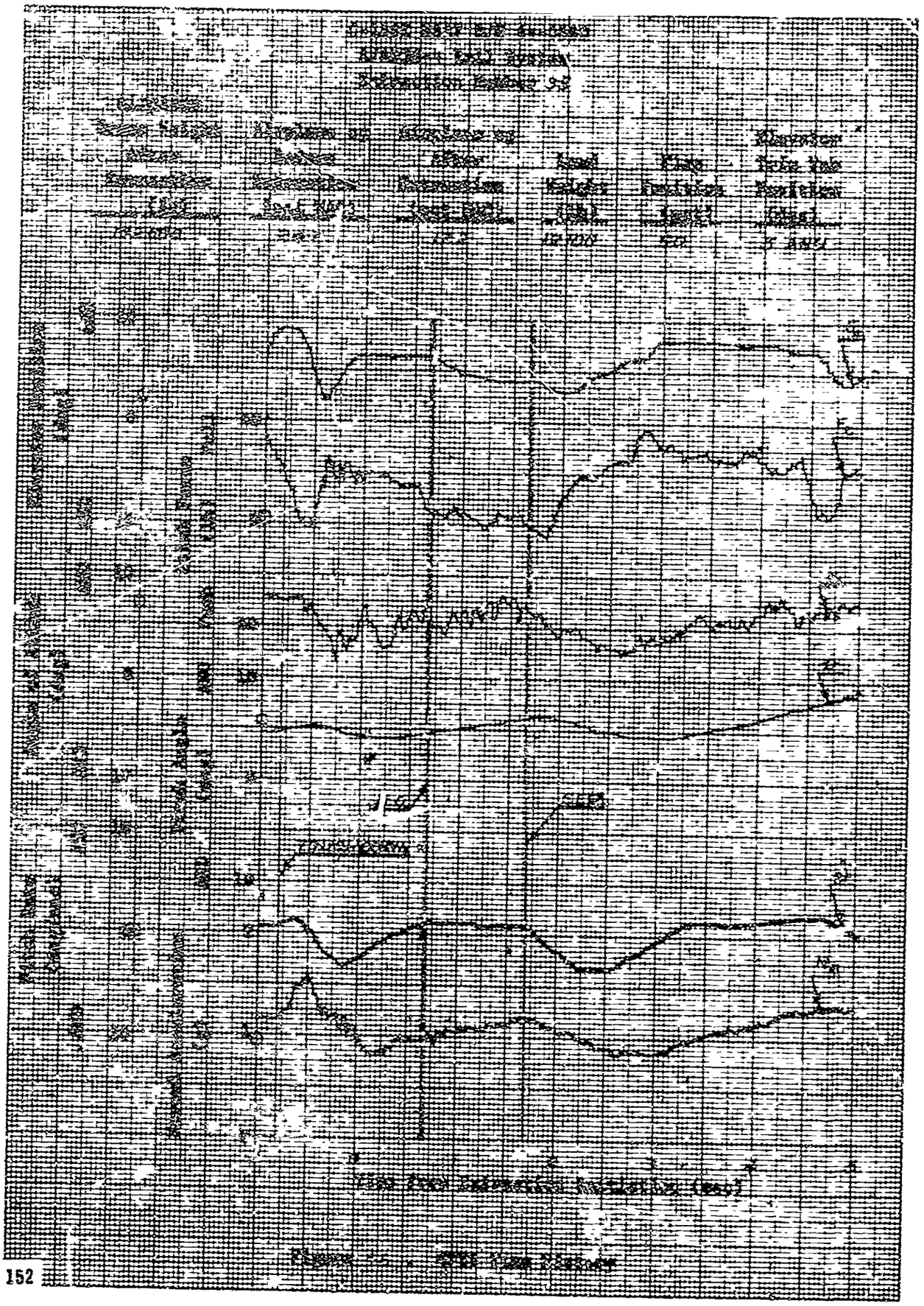


Figure 44. DTS Time History (concluded)







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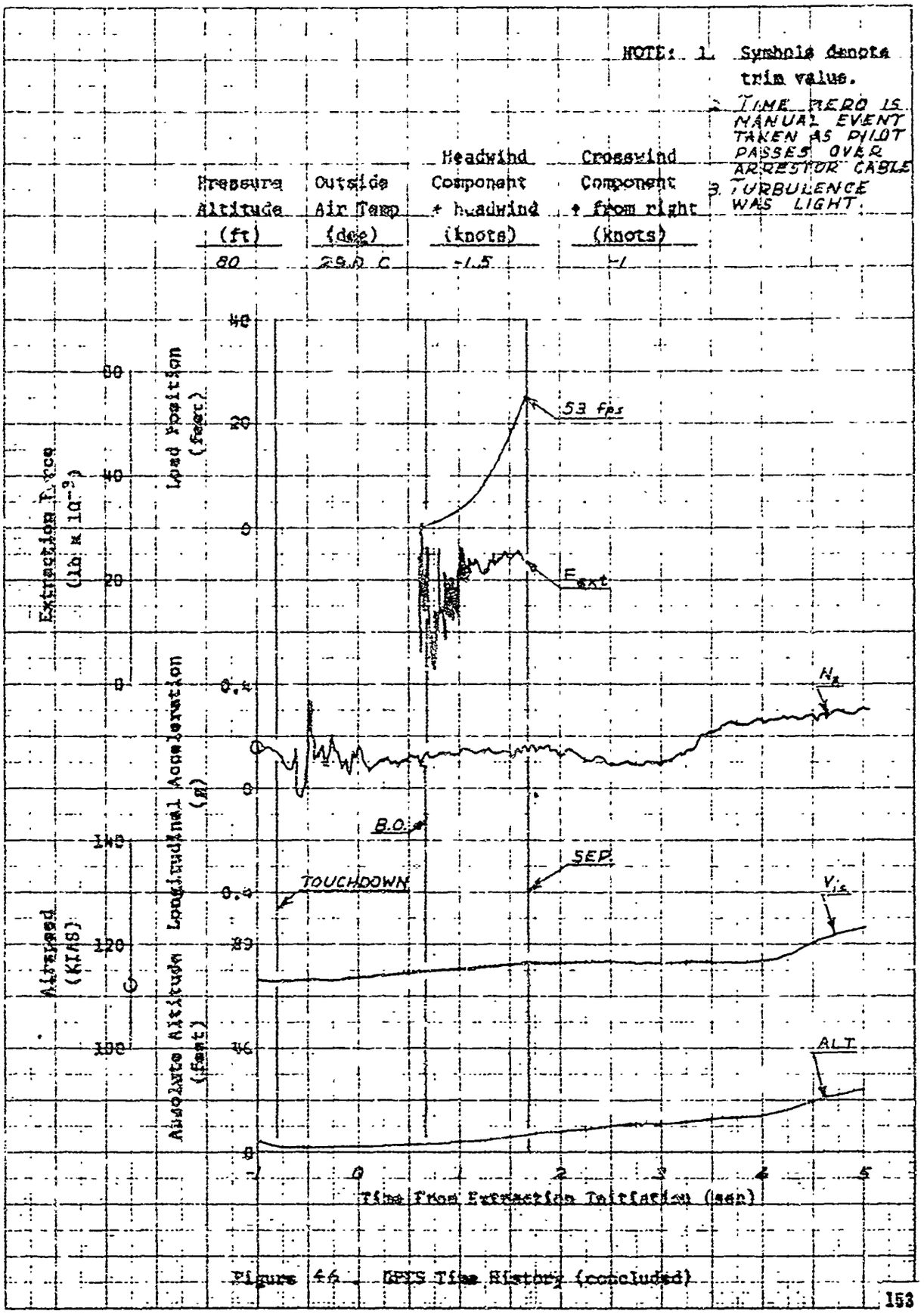
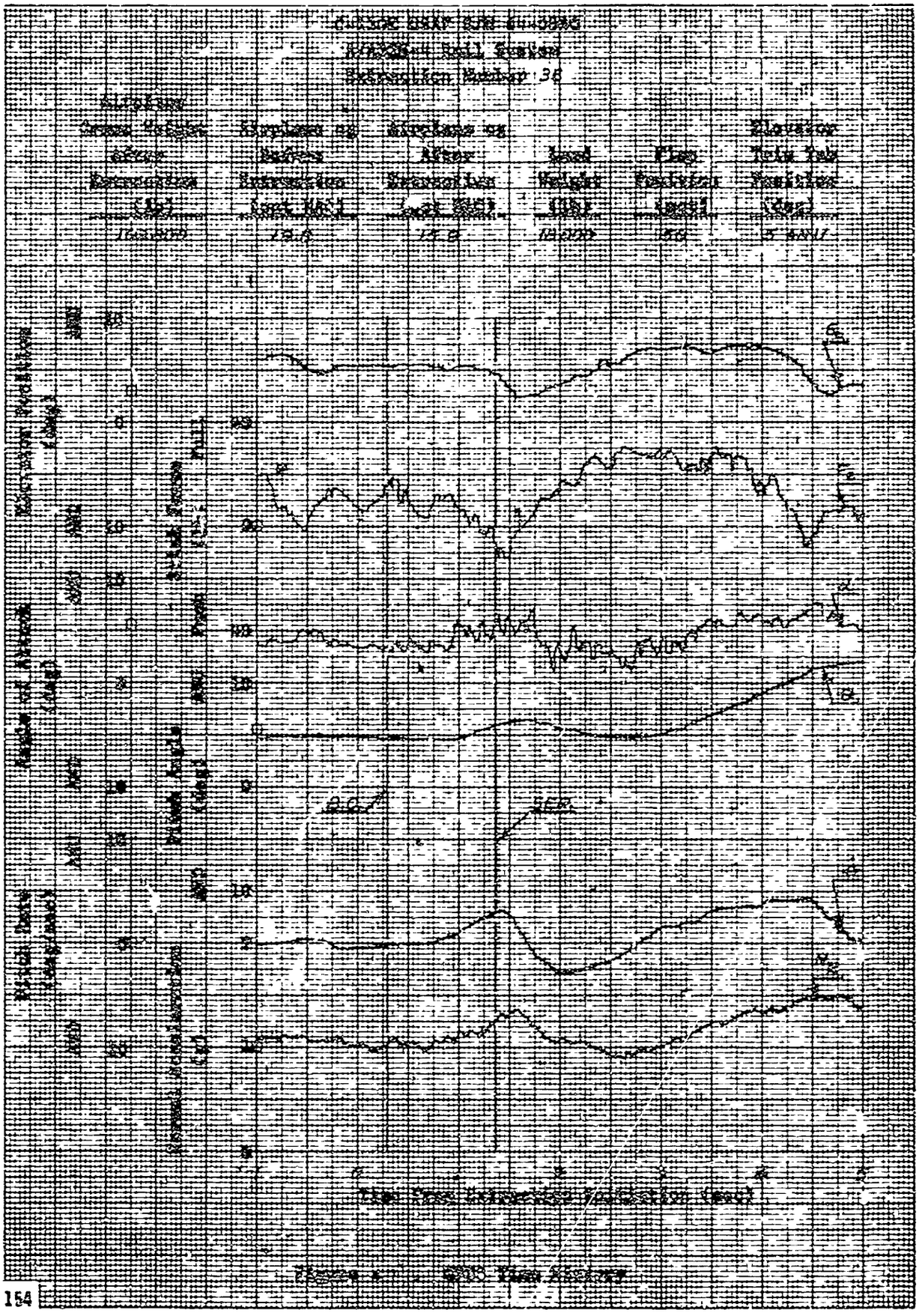


Figure 46. RPTS Time History (concluded)



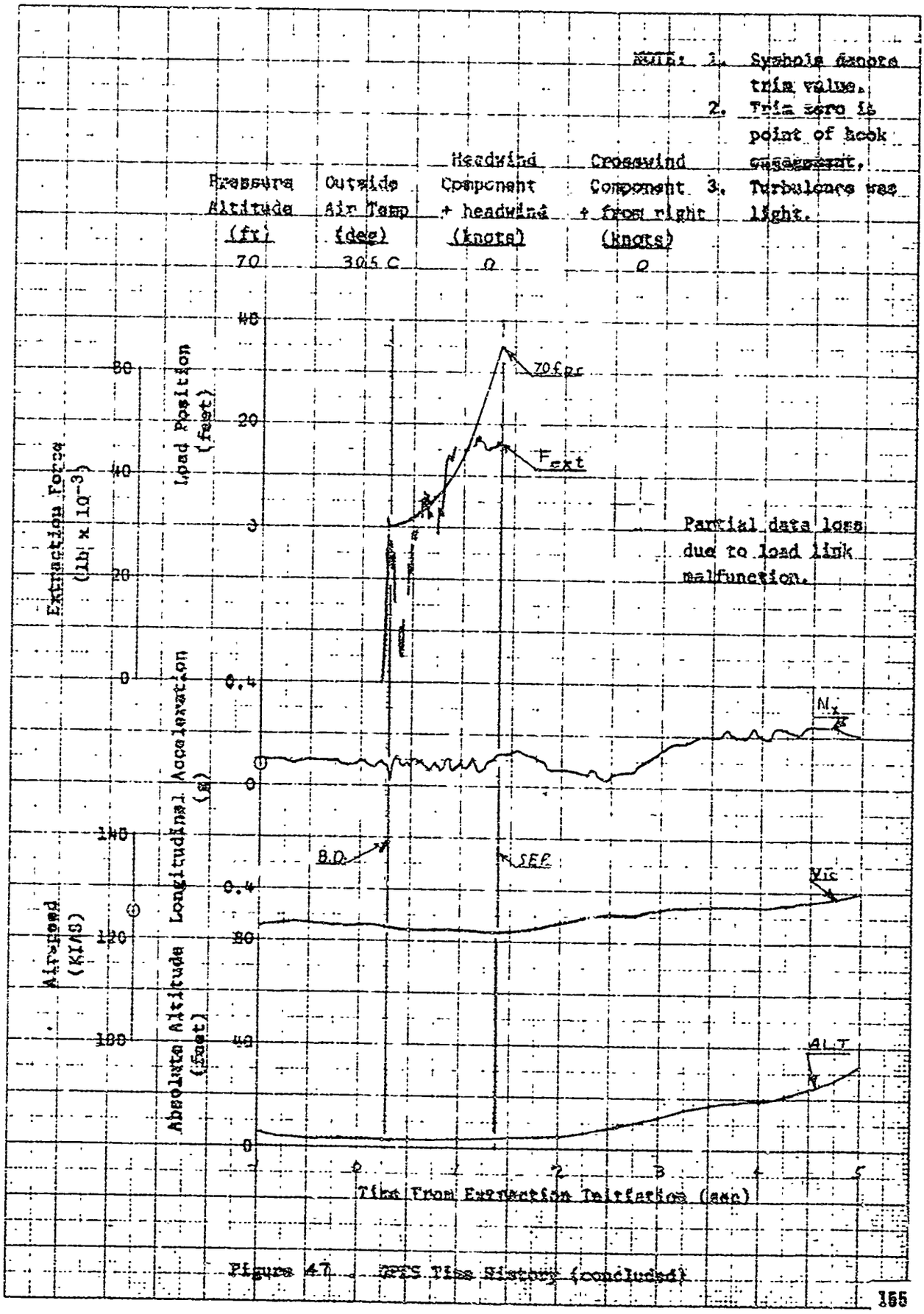
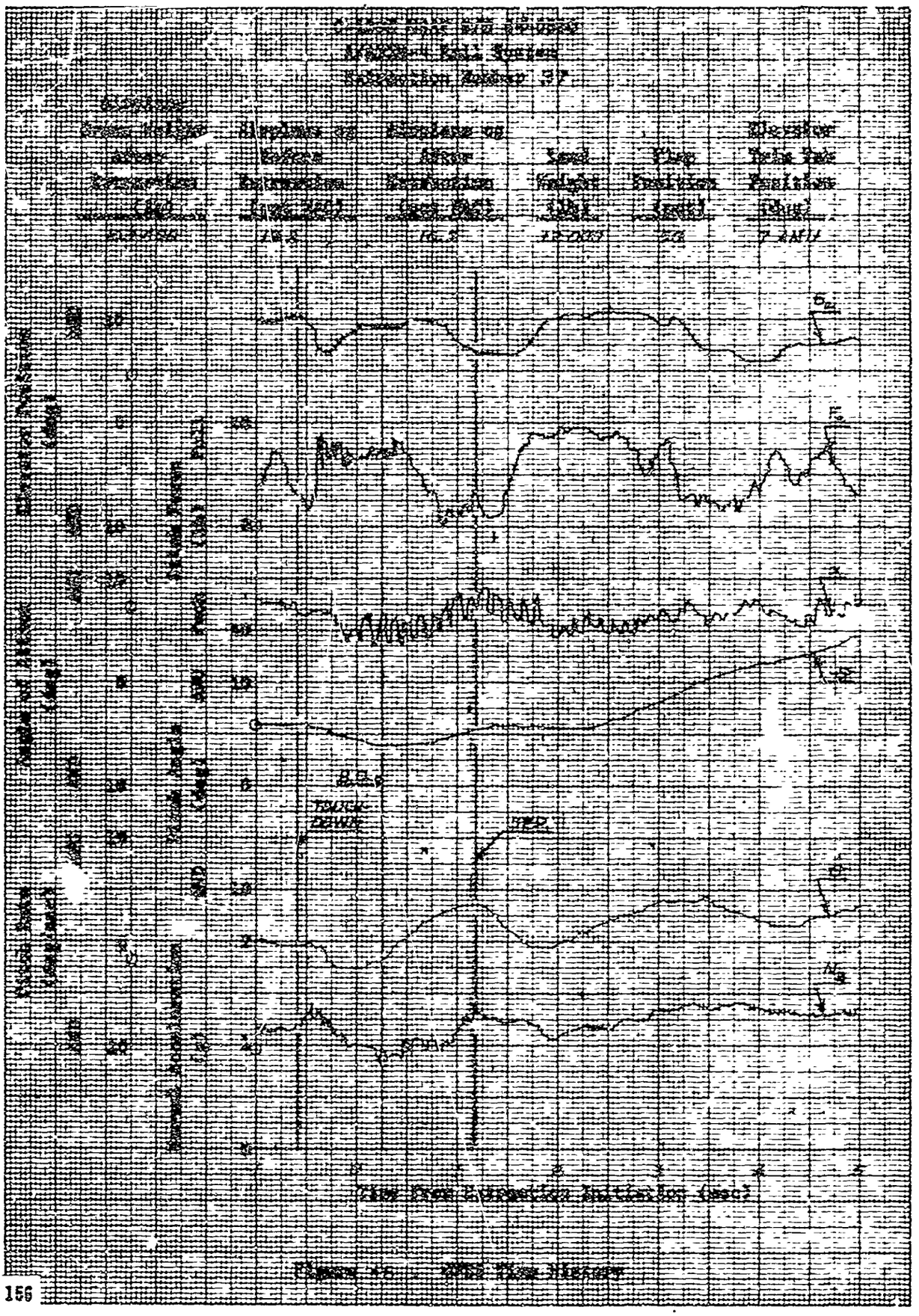


Figure 47. ZPES Time History (concluded)



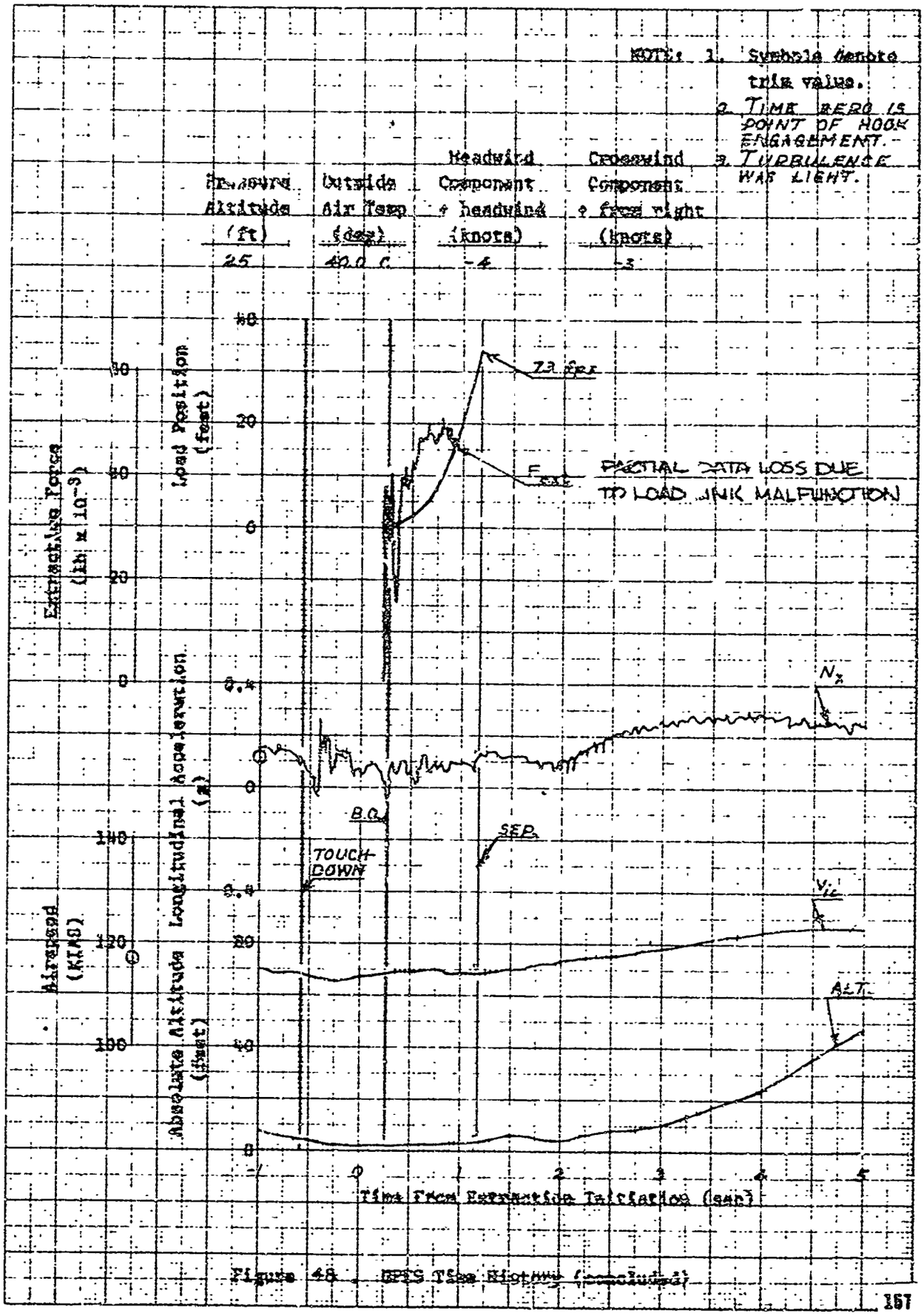
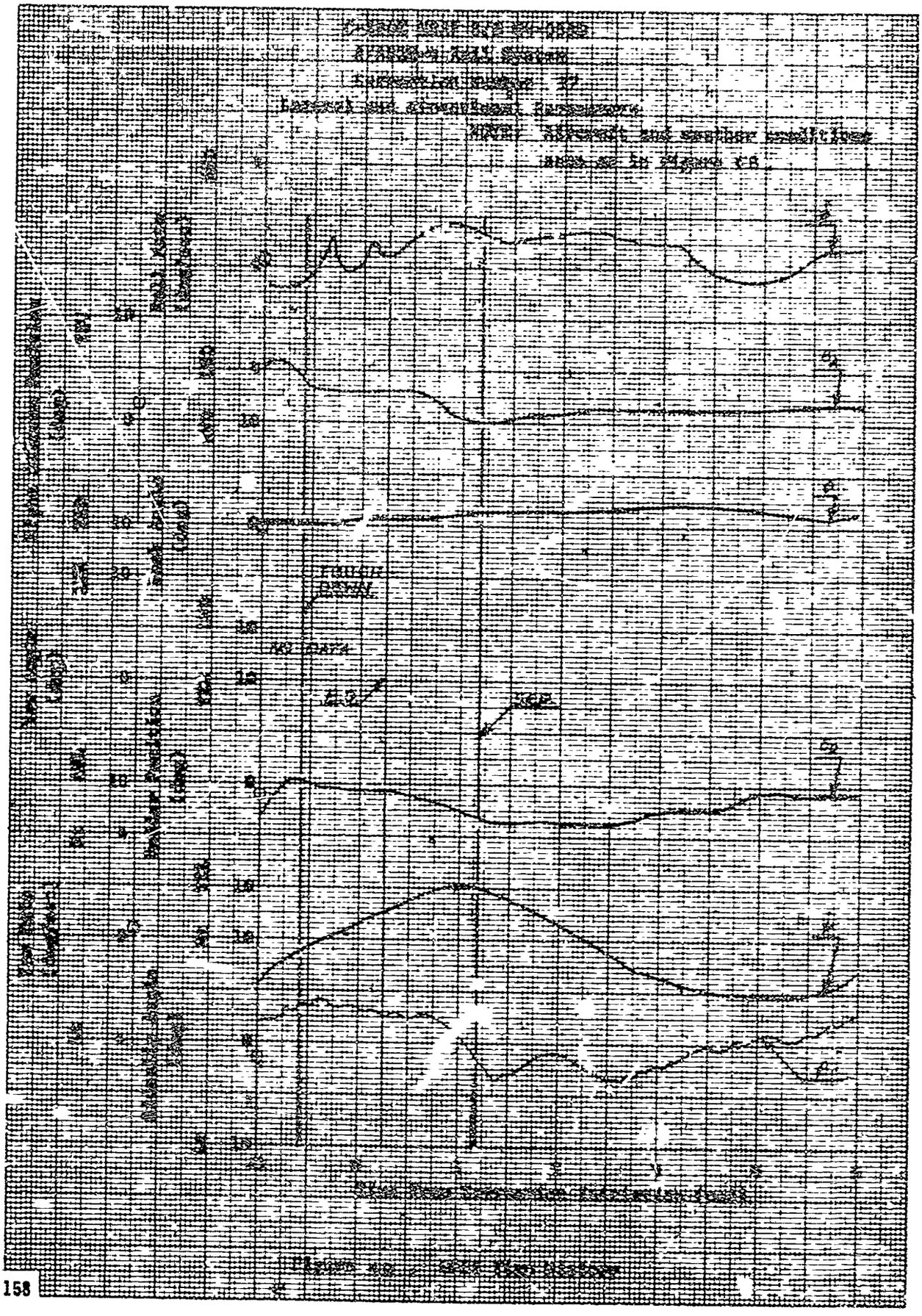
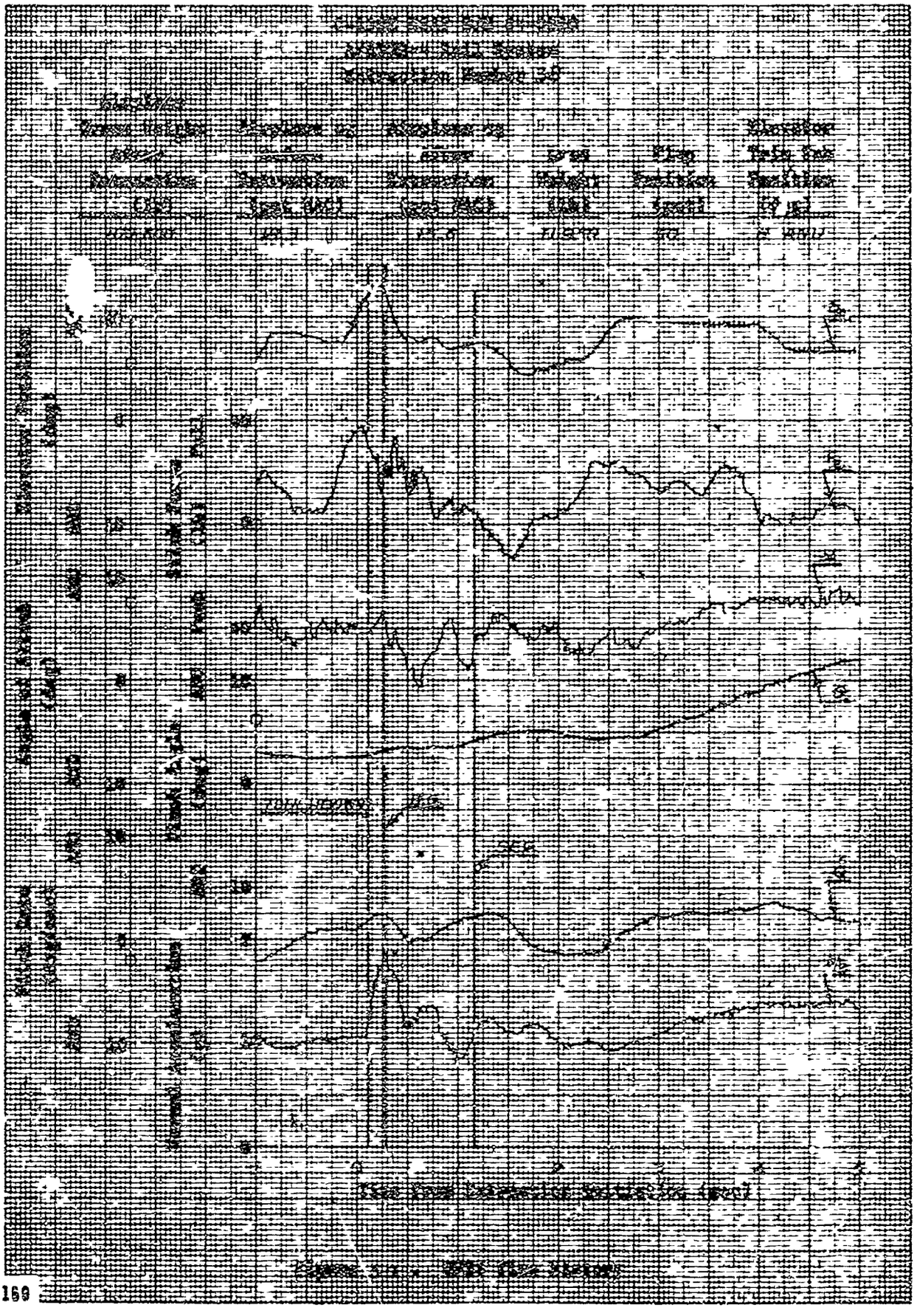


Figure 48. EPTS Time History (concluded)



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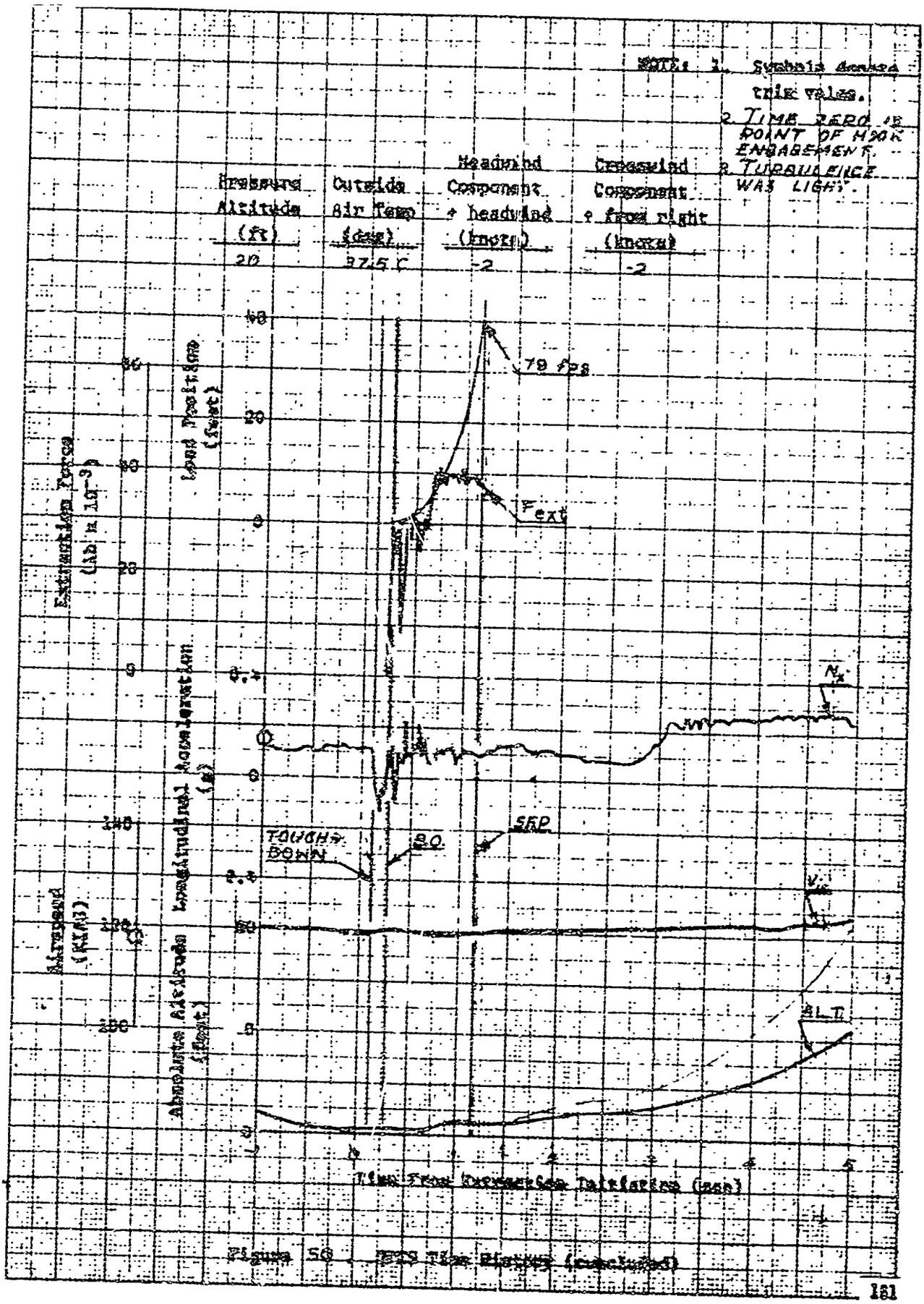
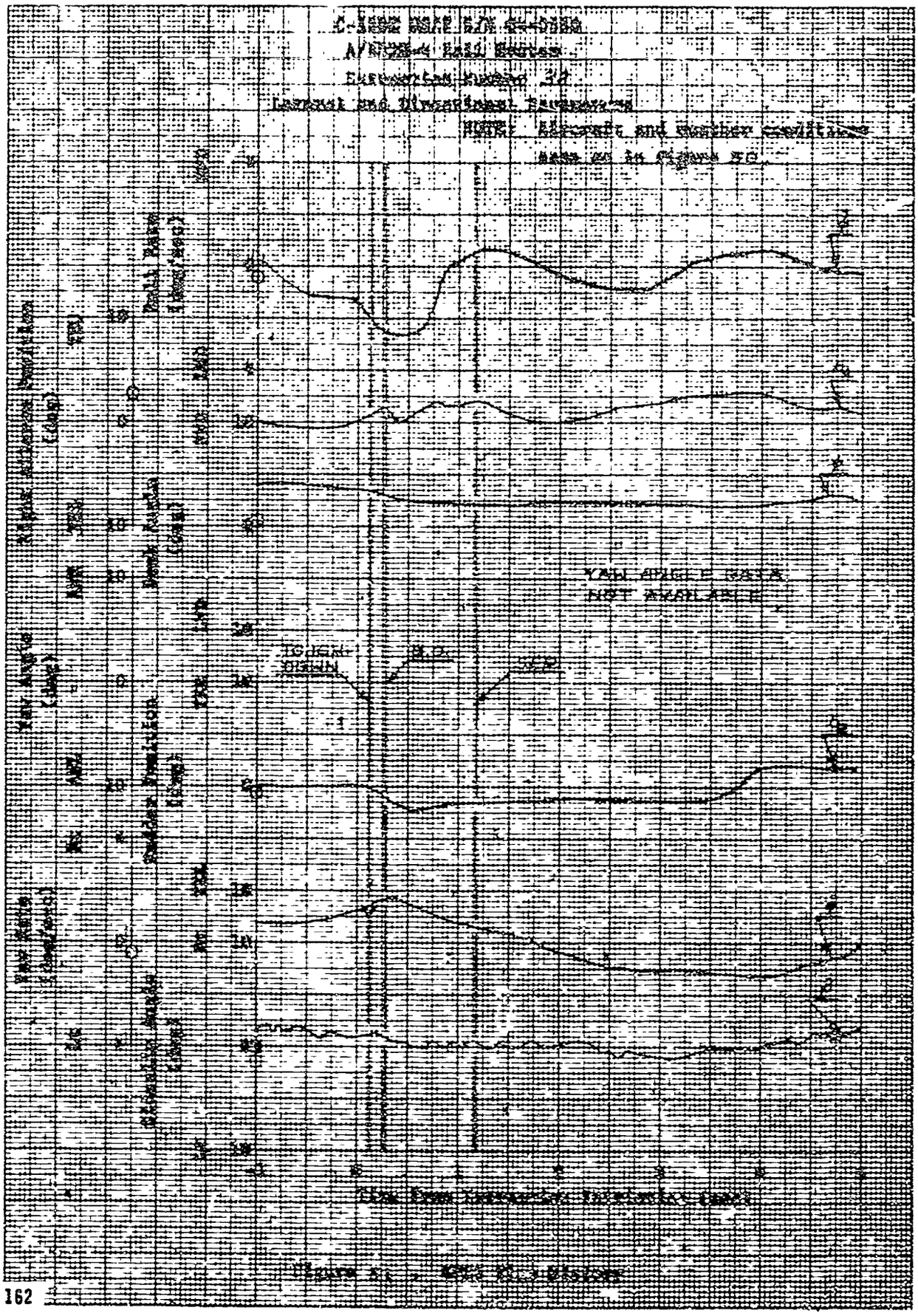


Figure 58. [illegible] (concluded)


YAW ANGLE DATA
NOT AVAILABLE

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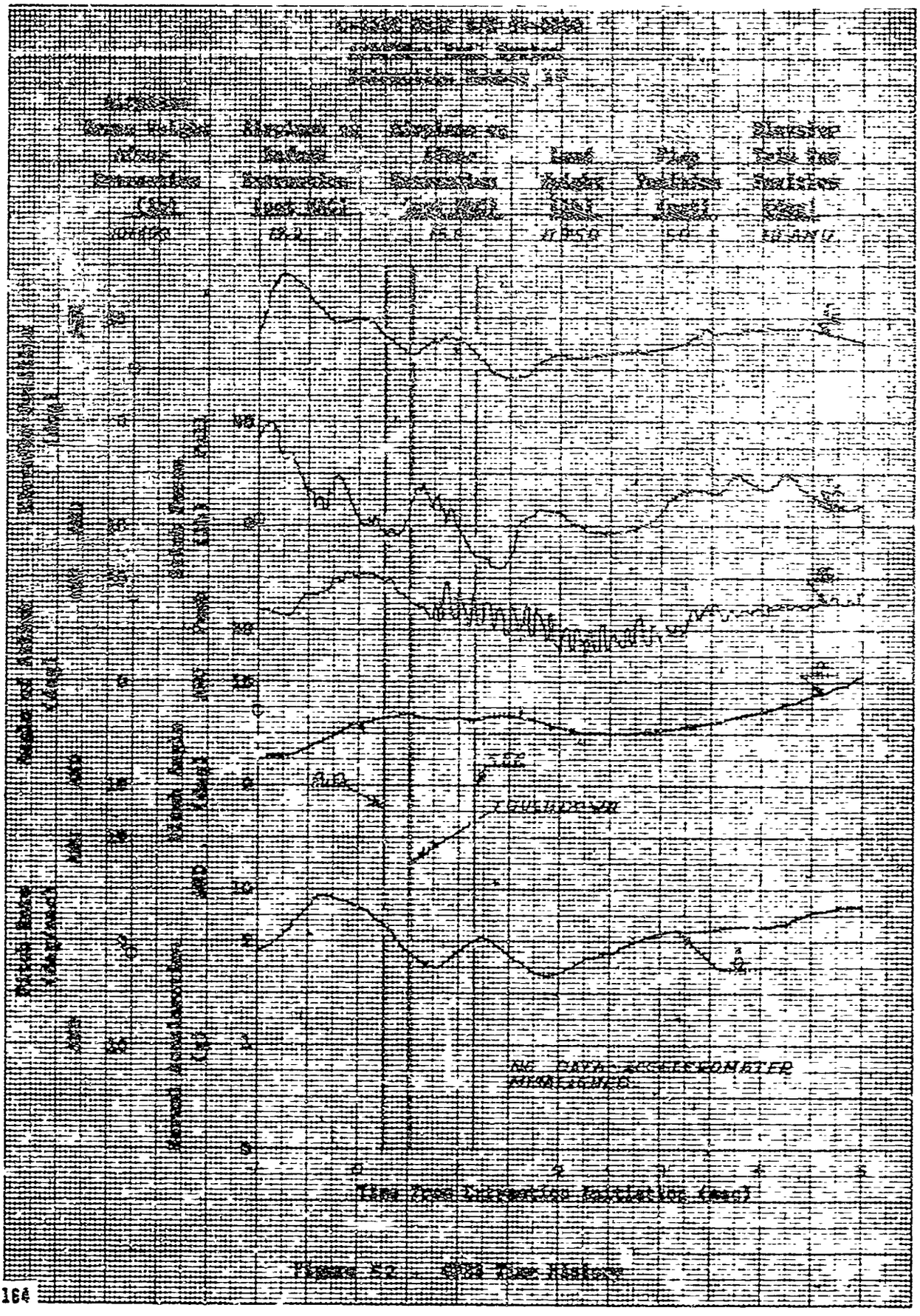
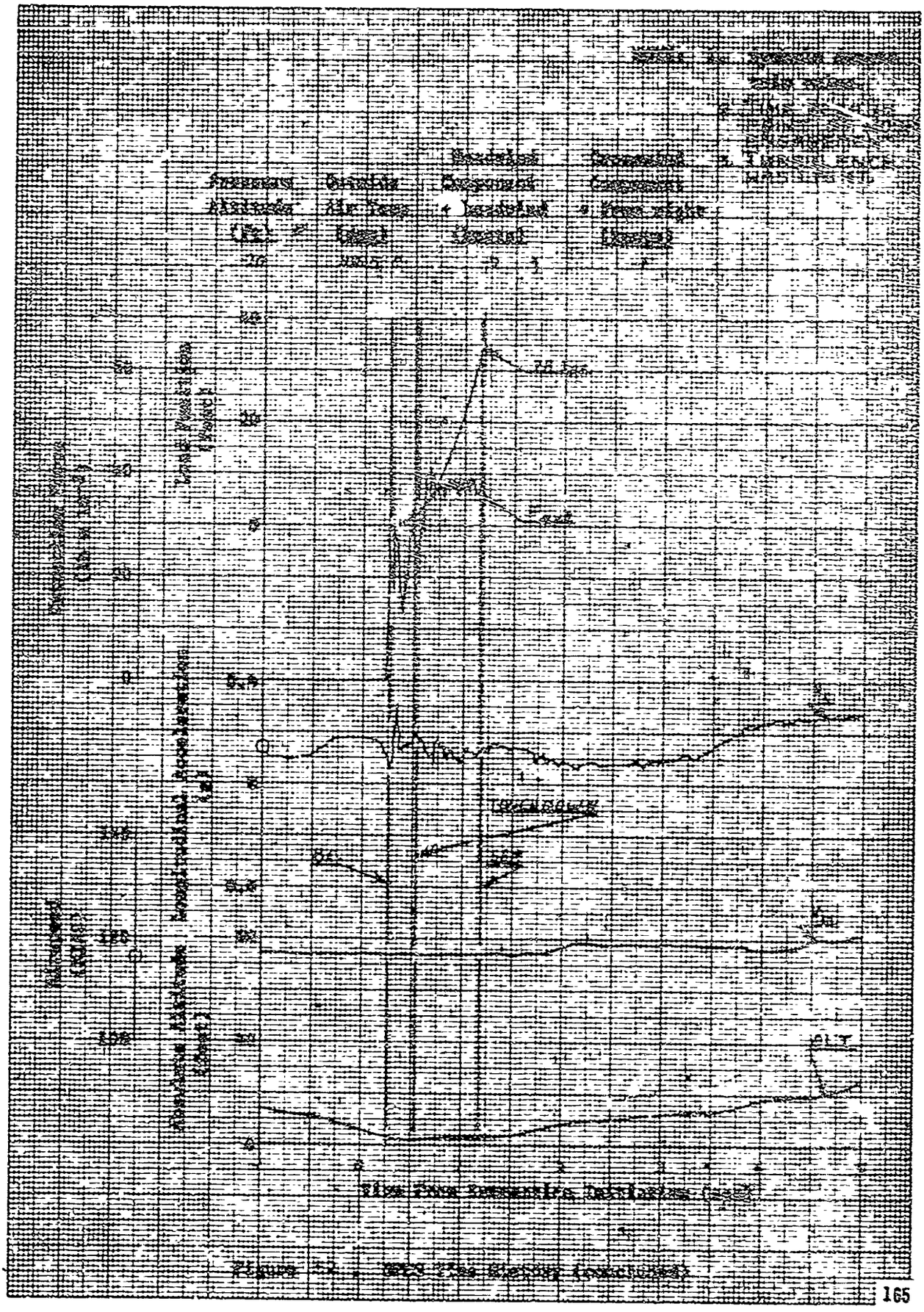
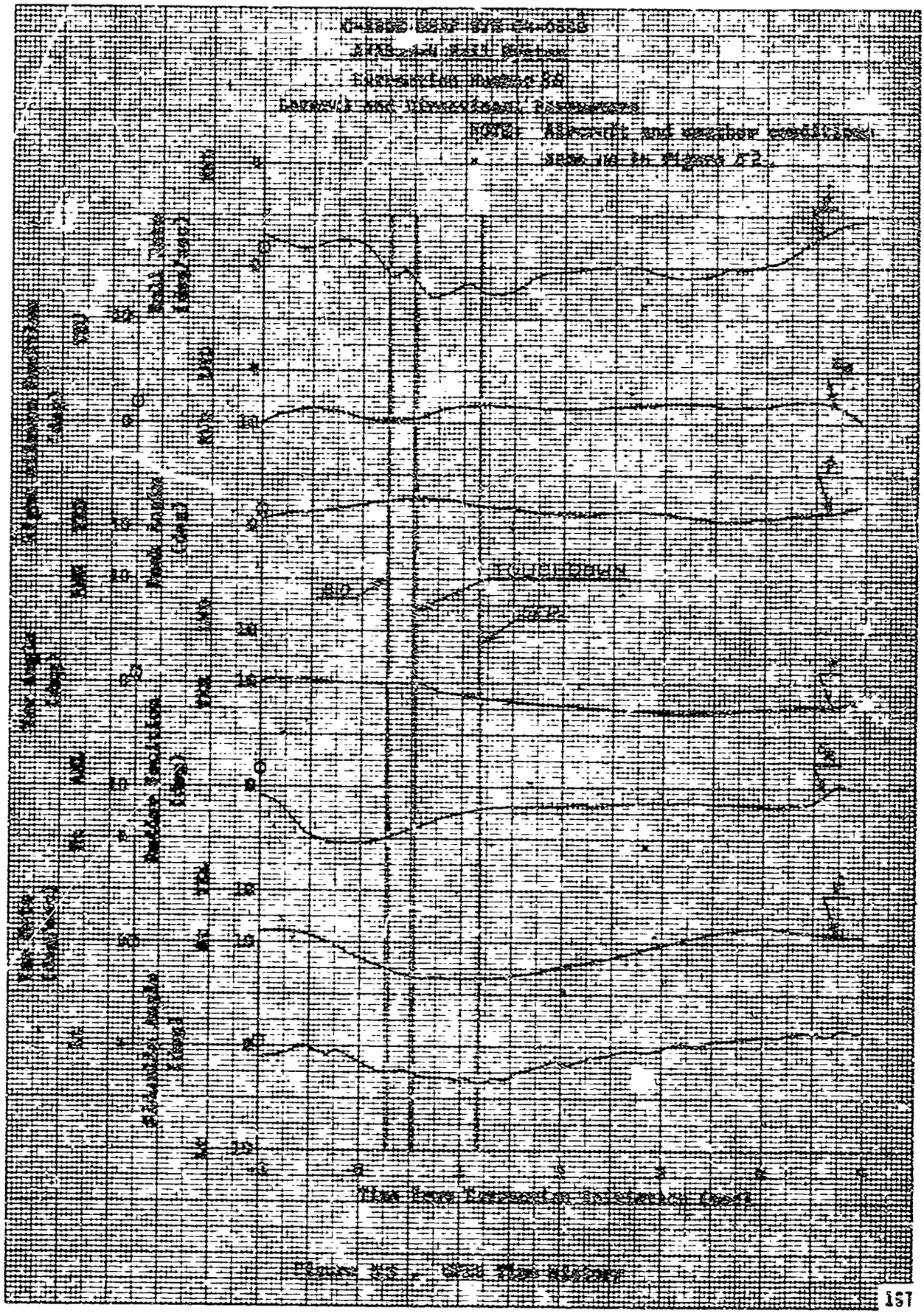
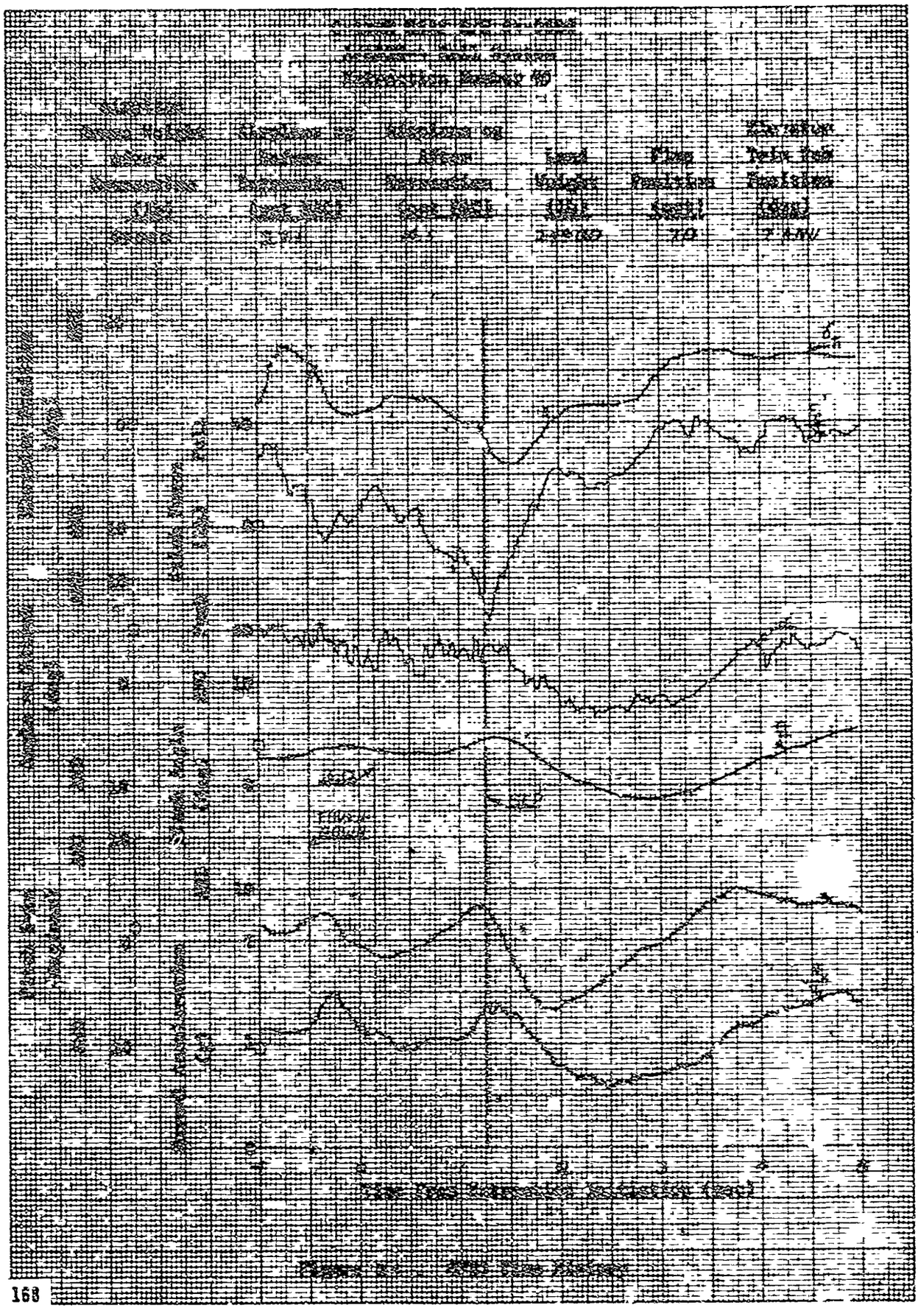


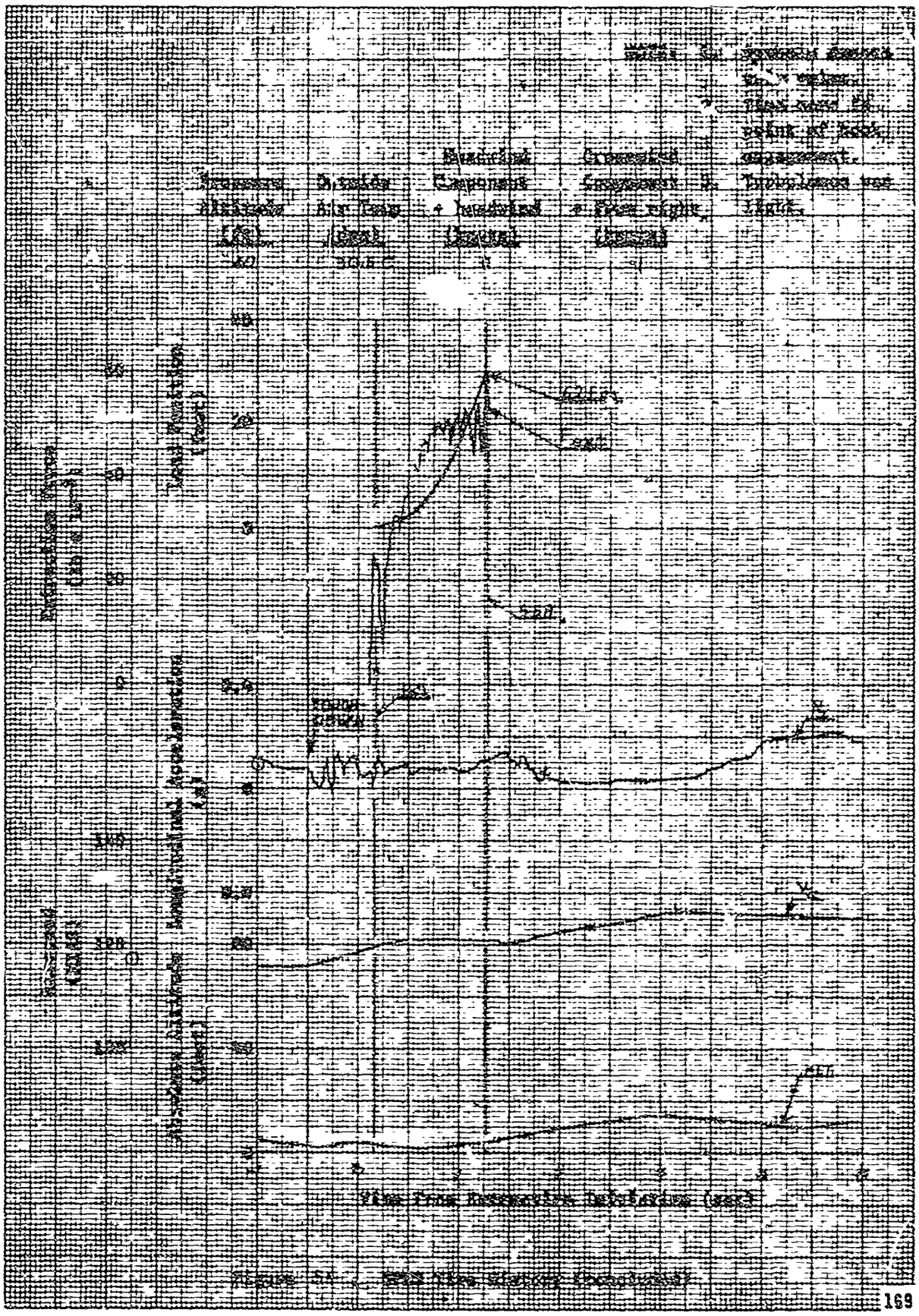
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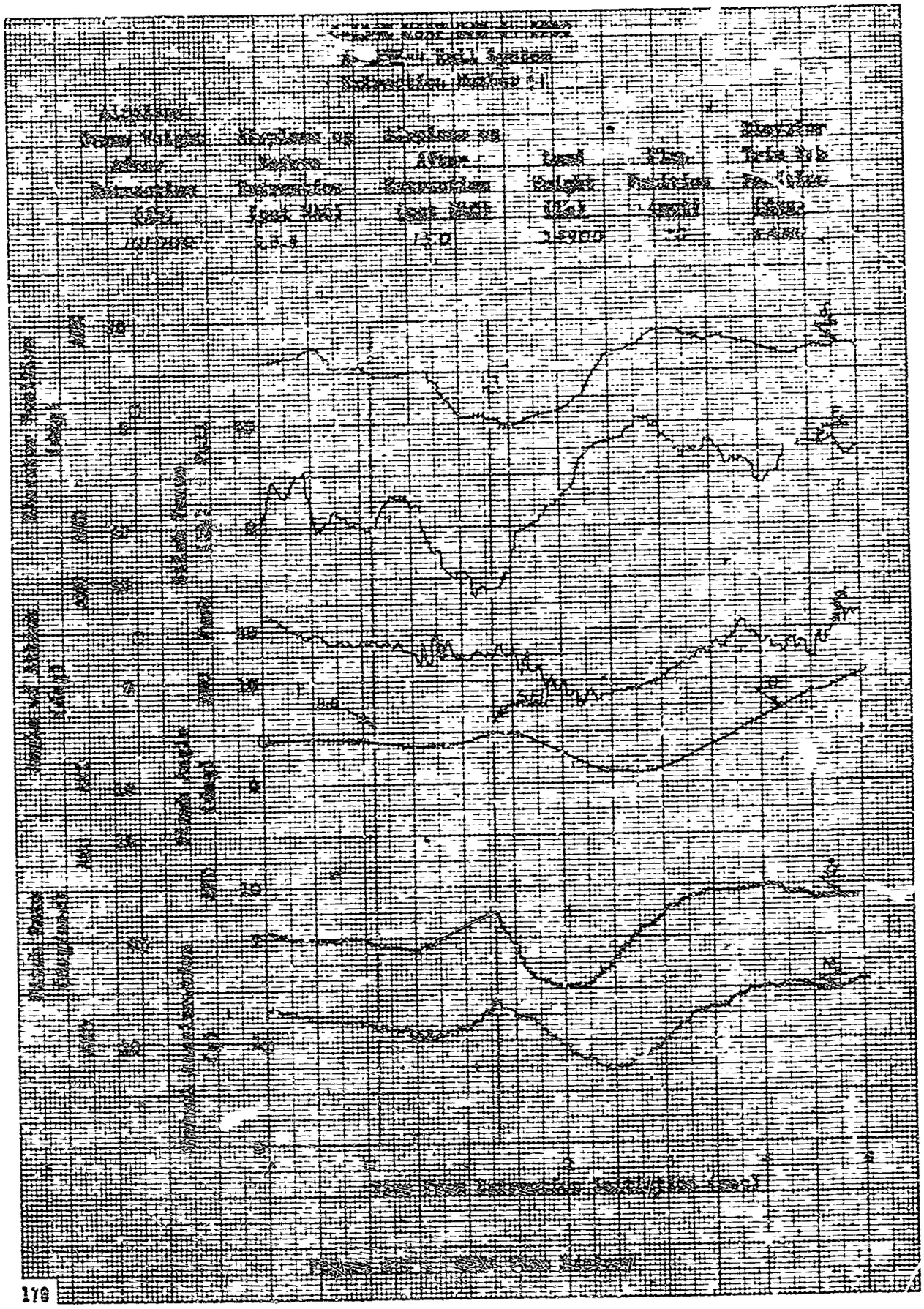


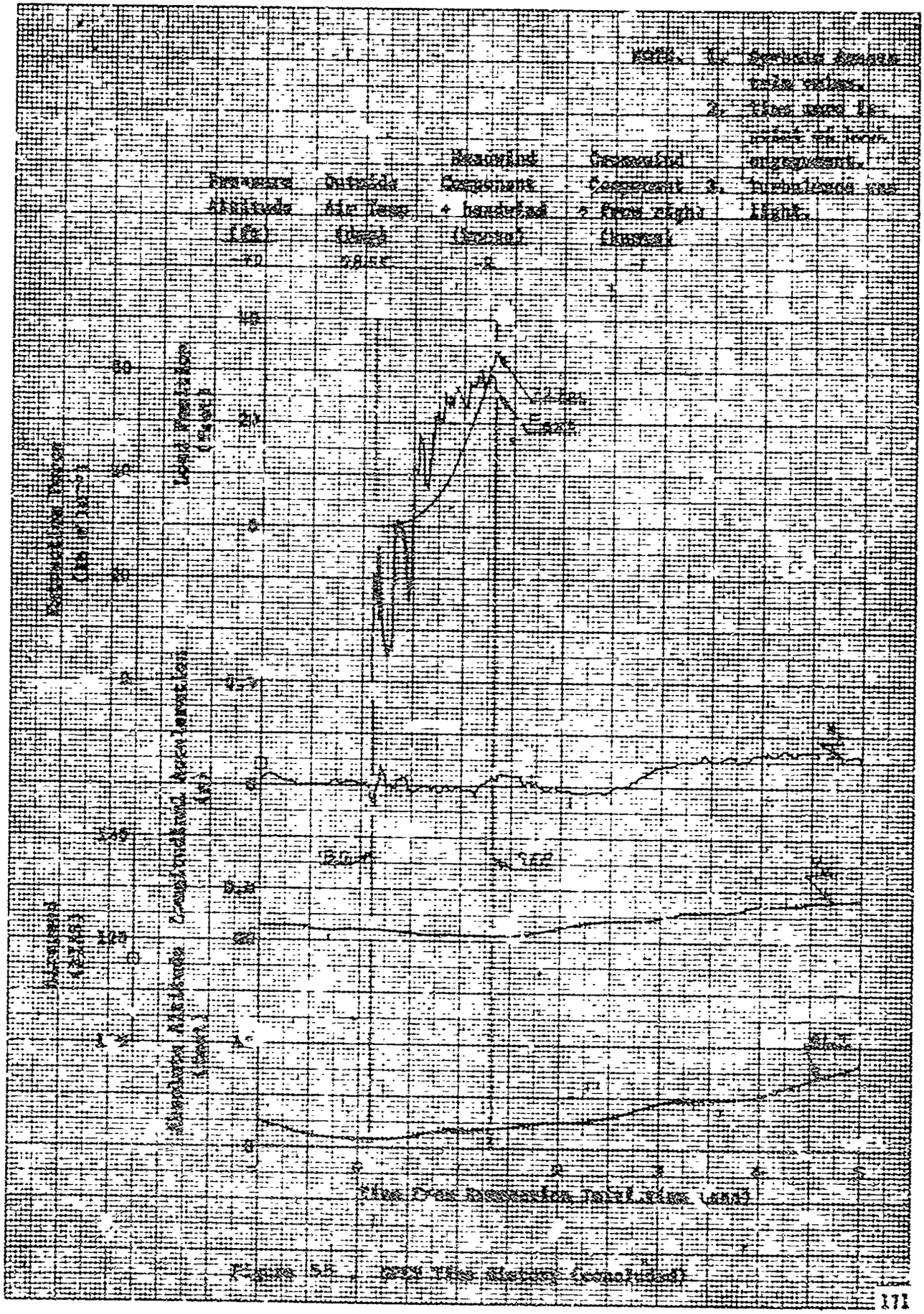
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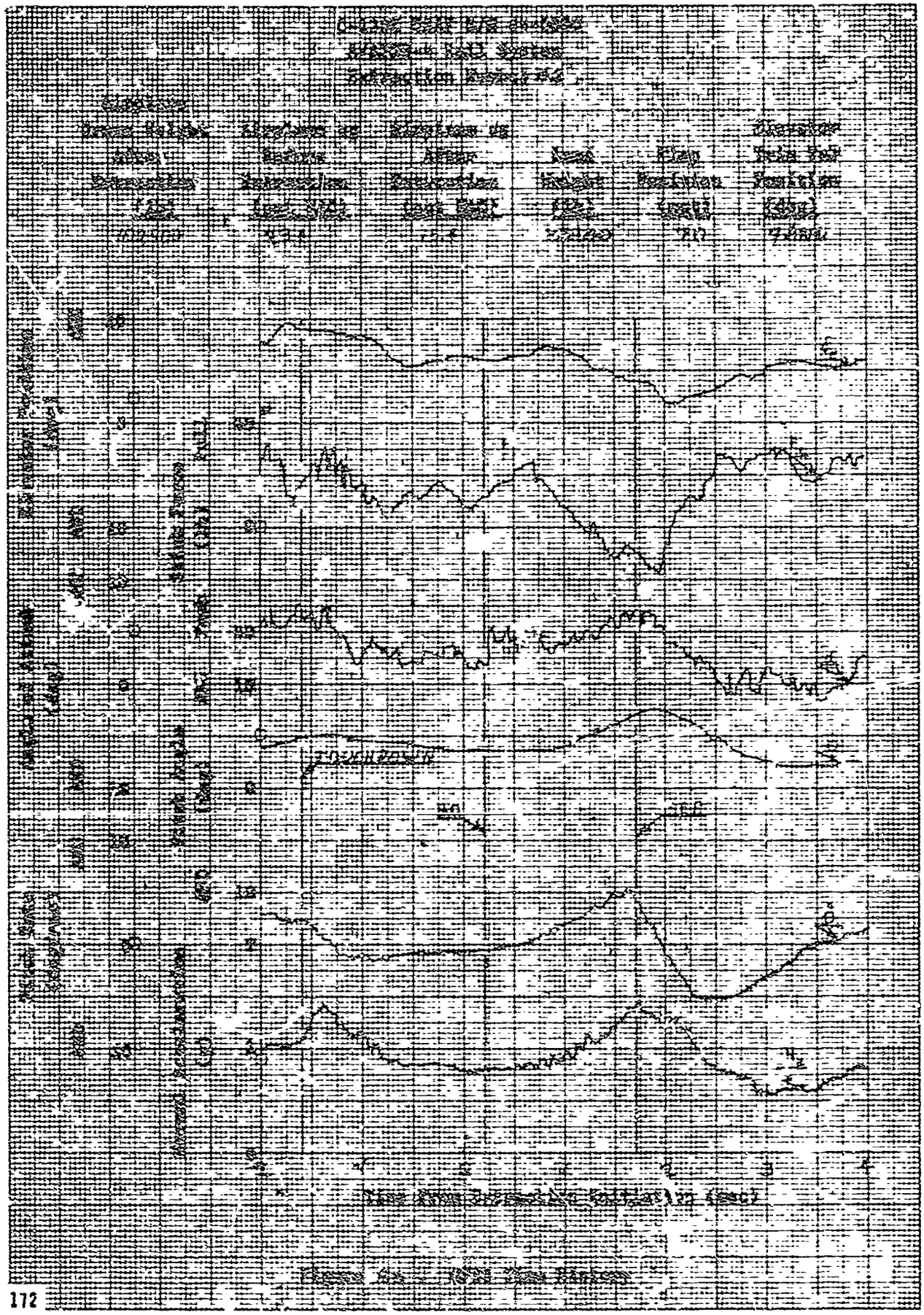


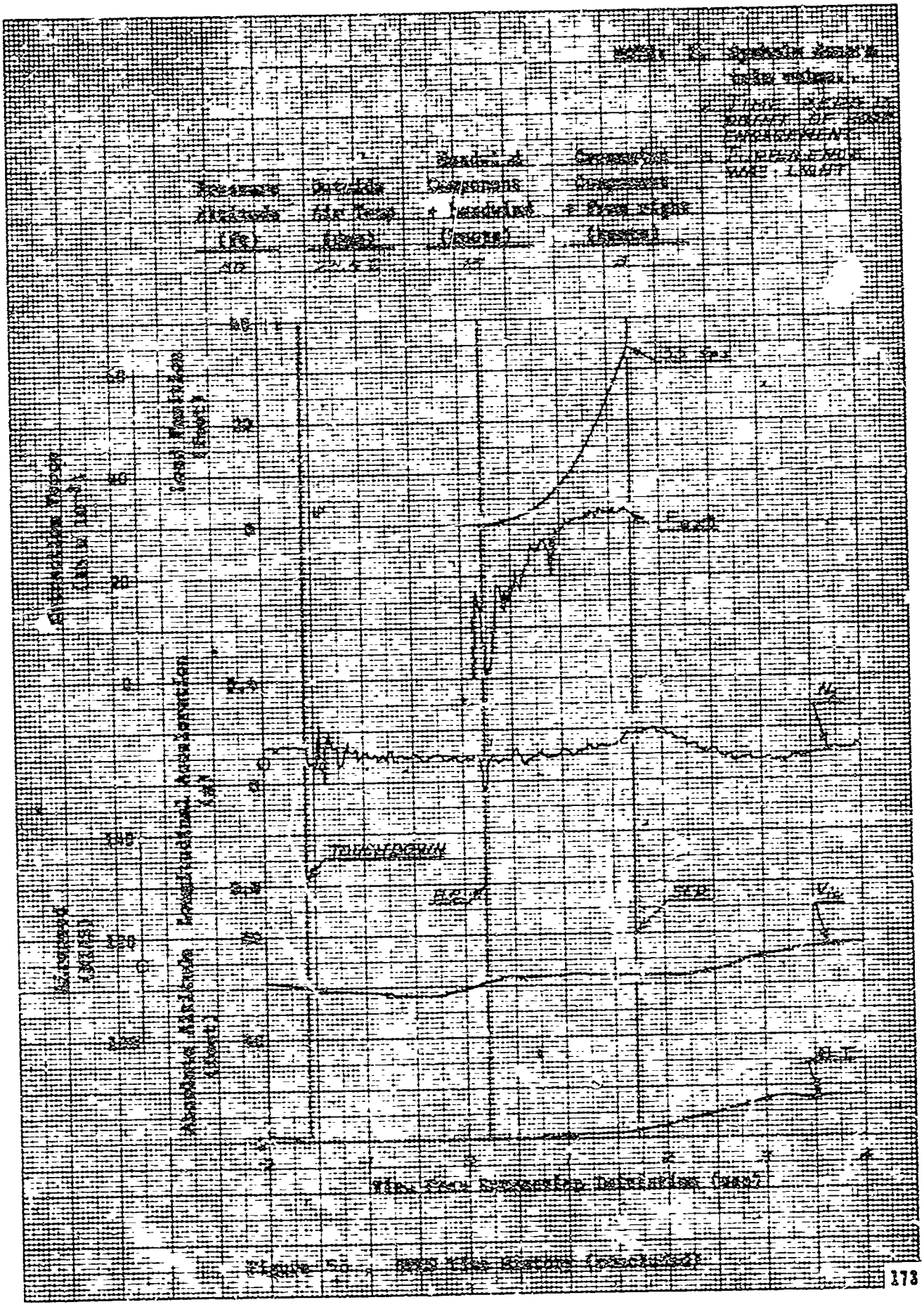


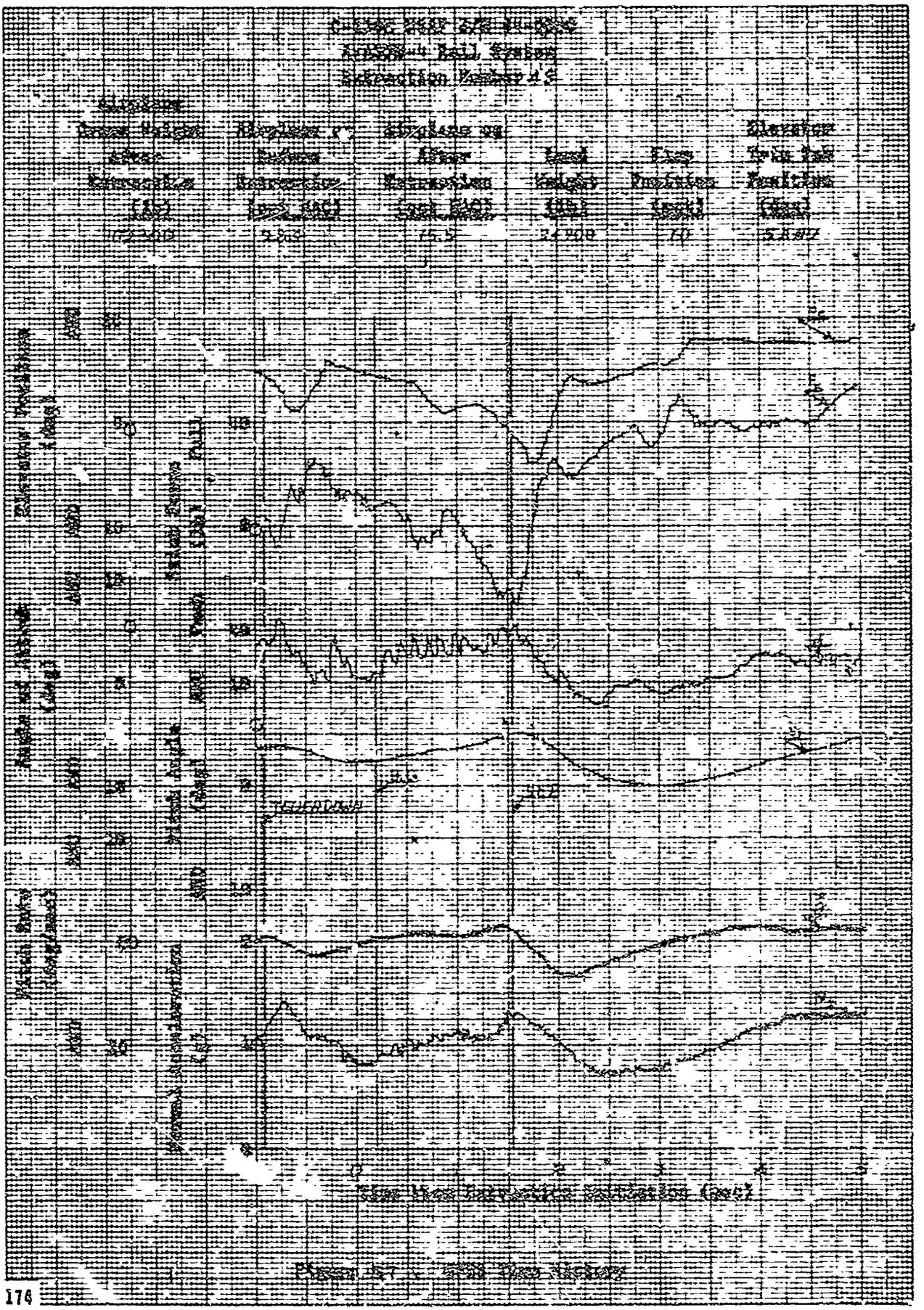


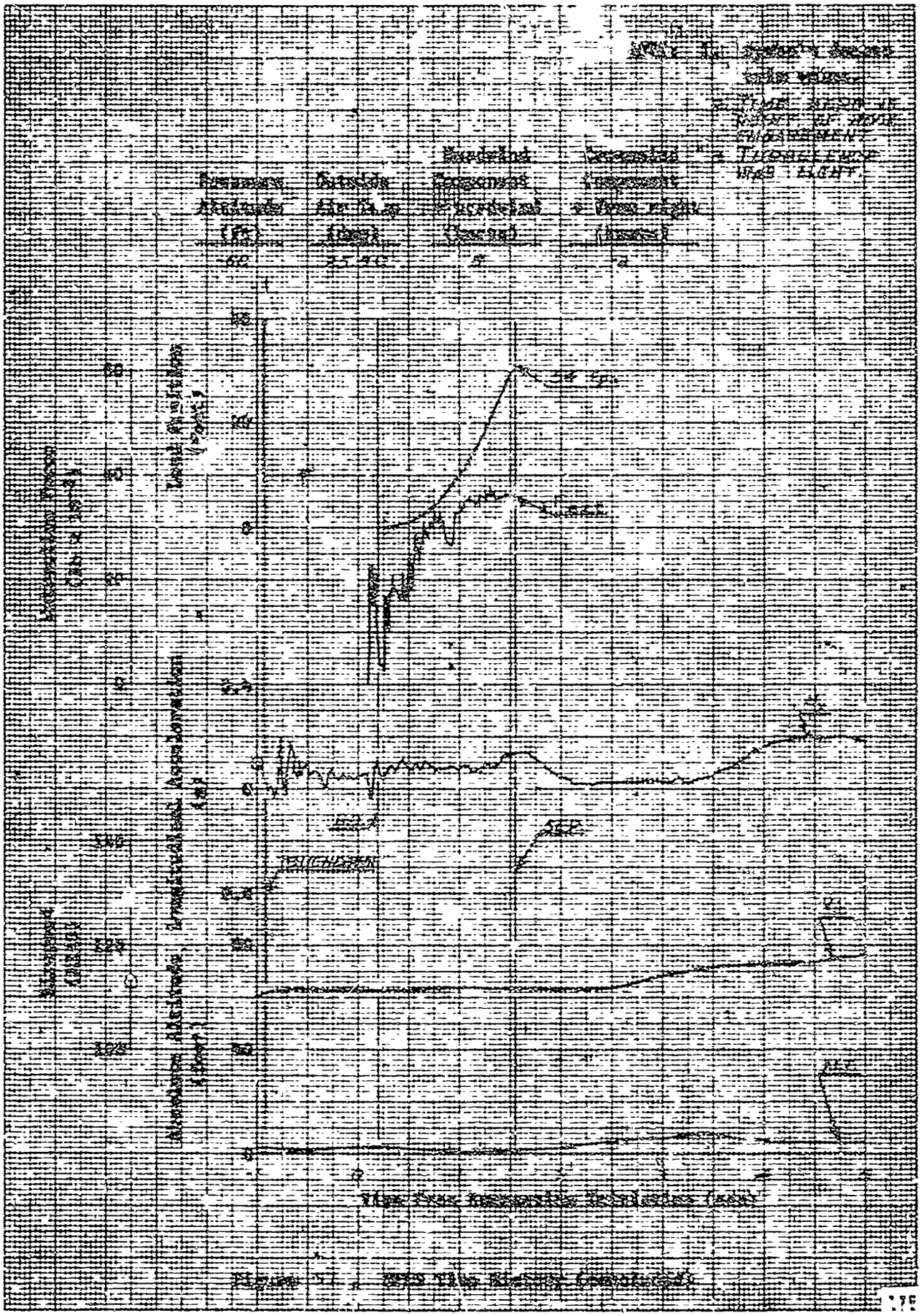


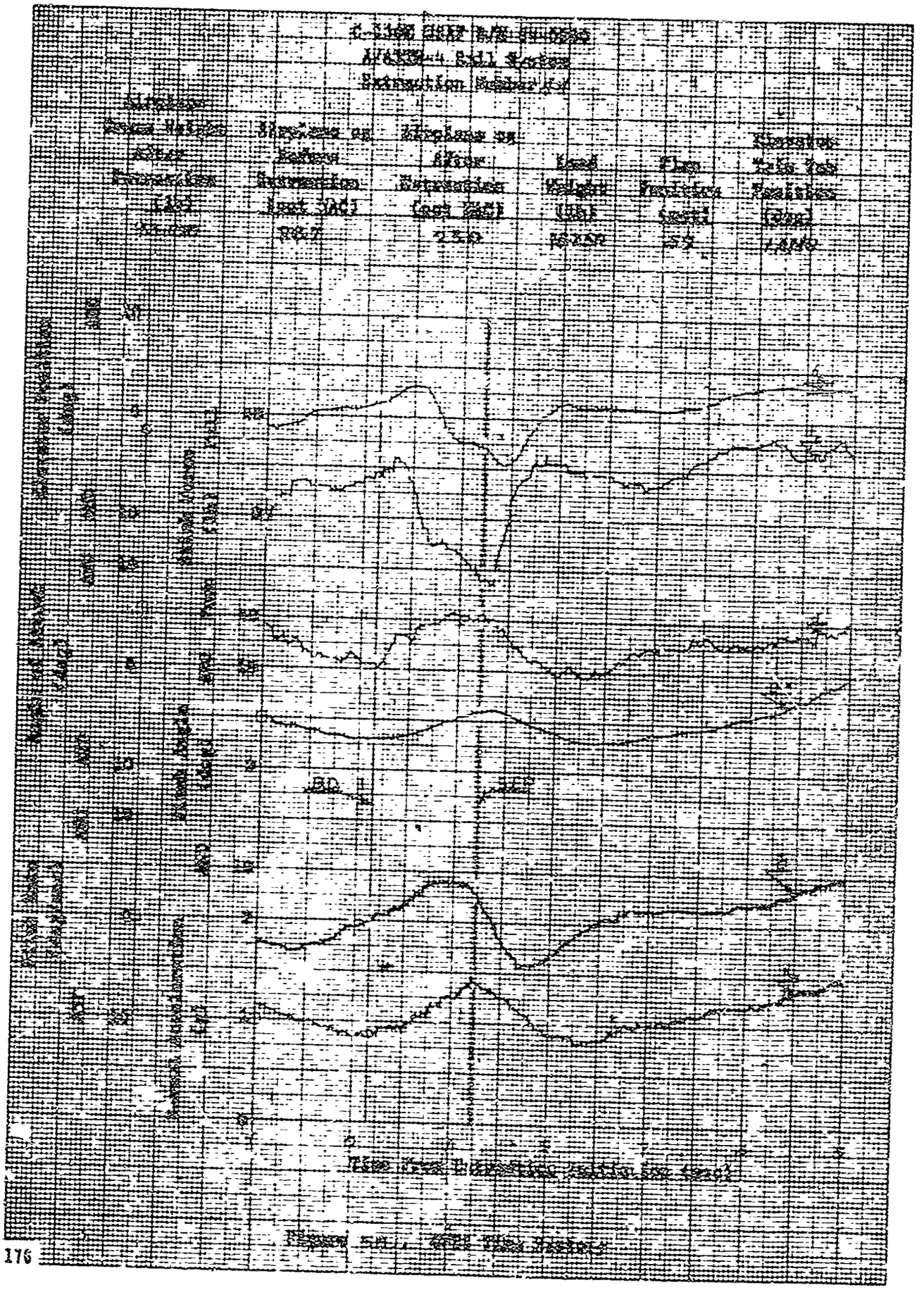


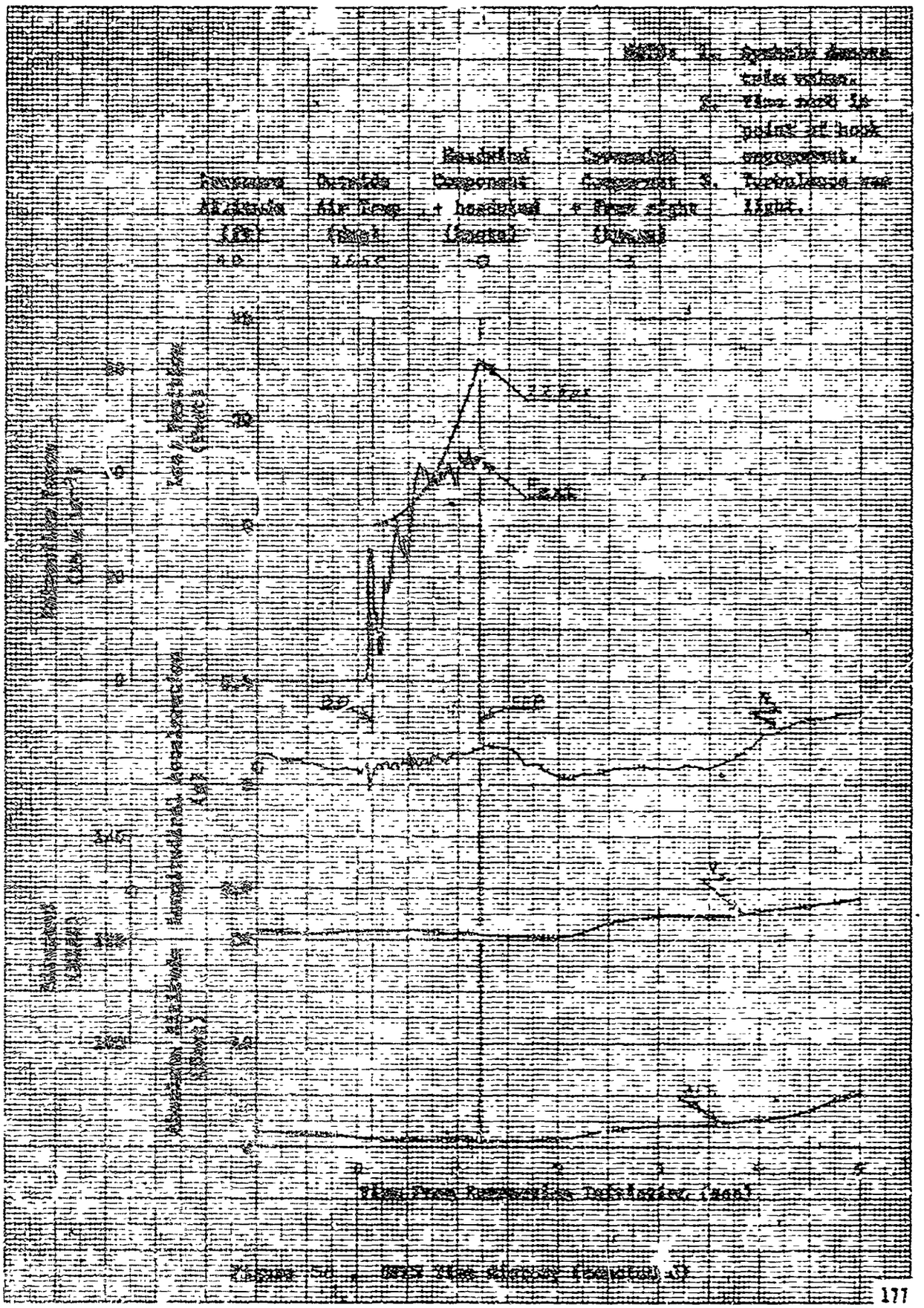


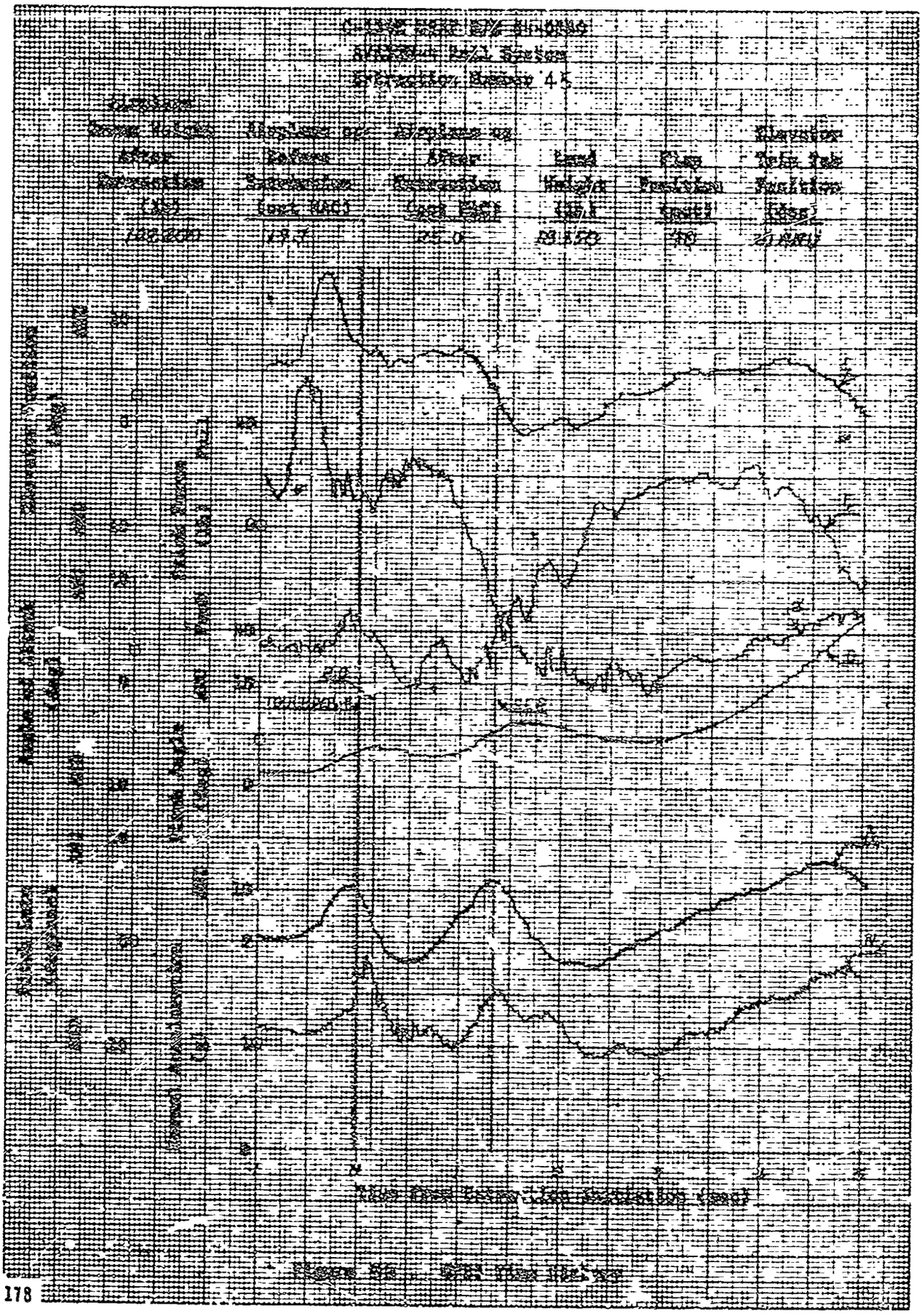












179

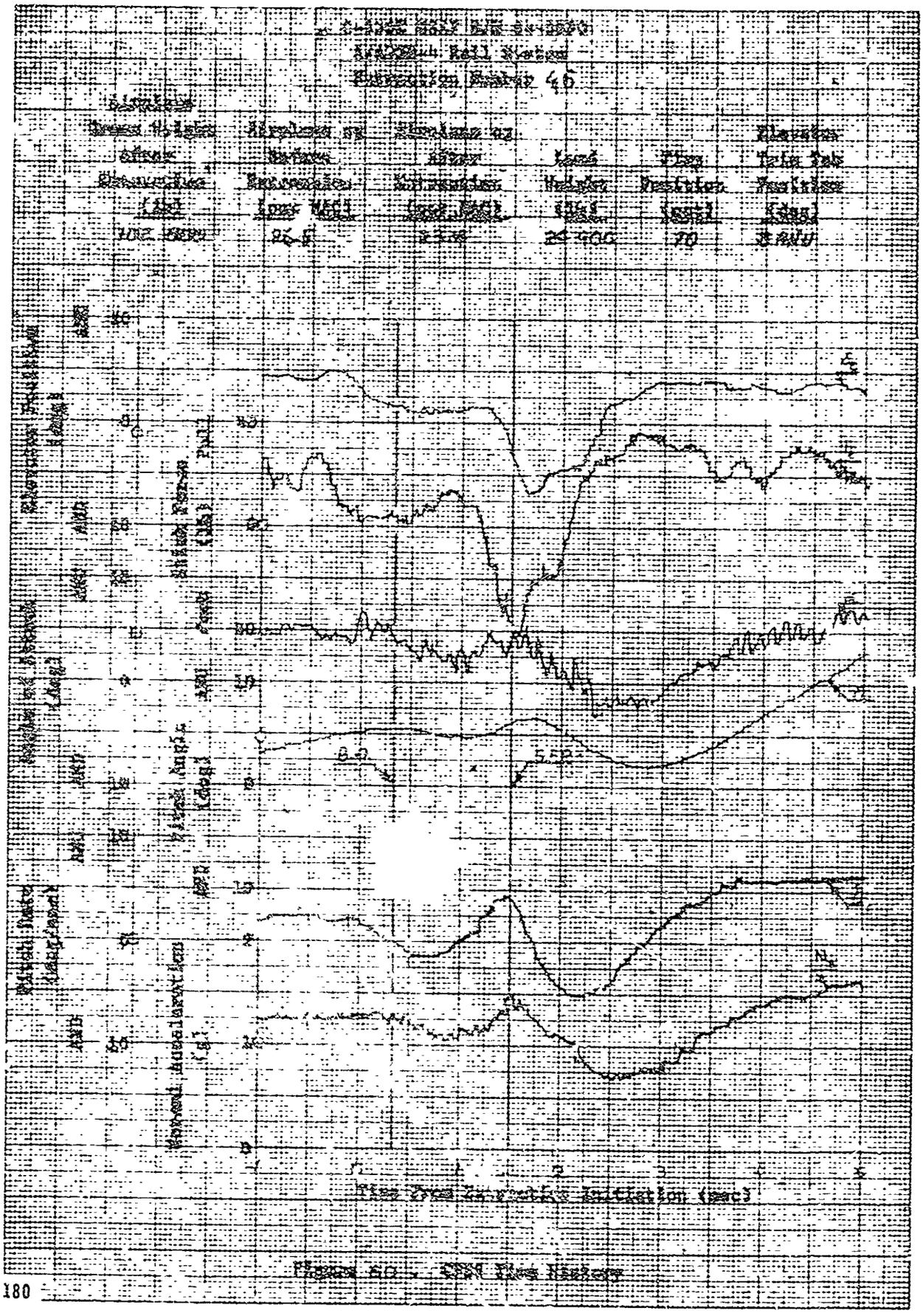


Figure 60 - SSME Flow Network

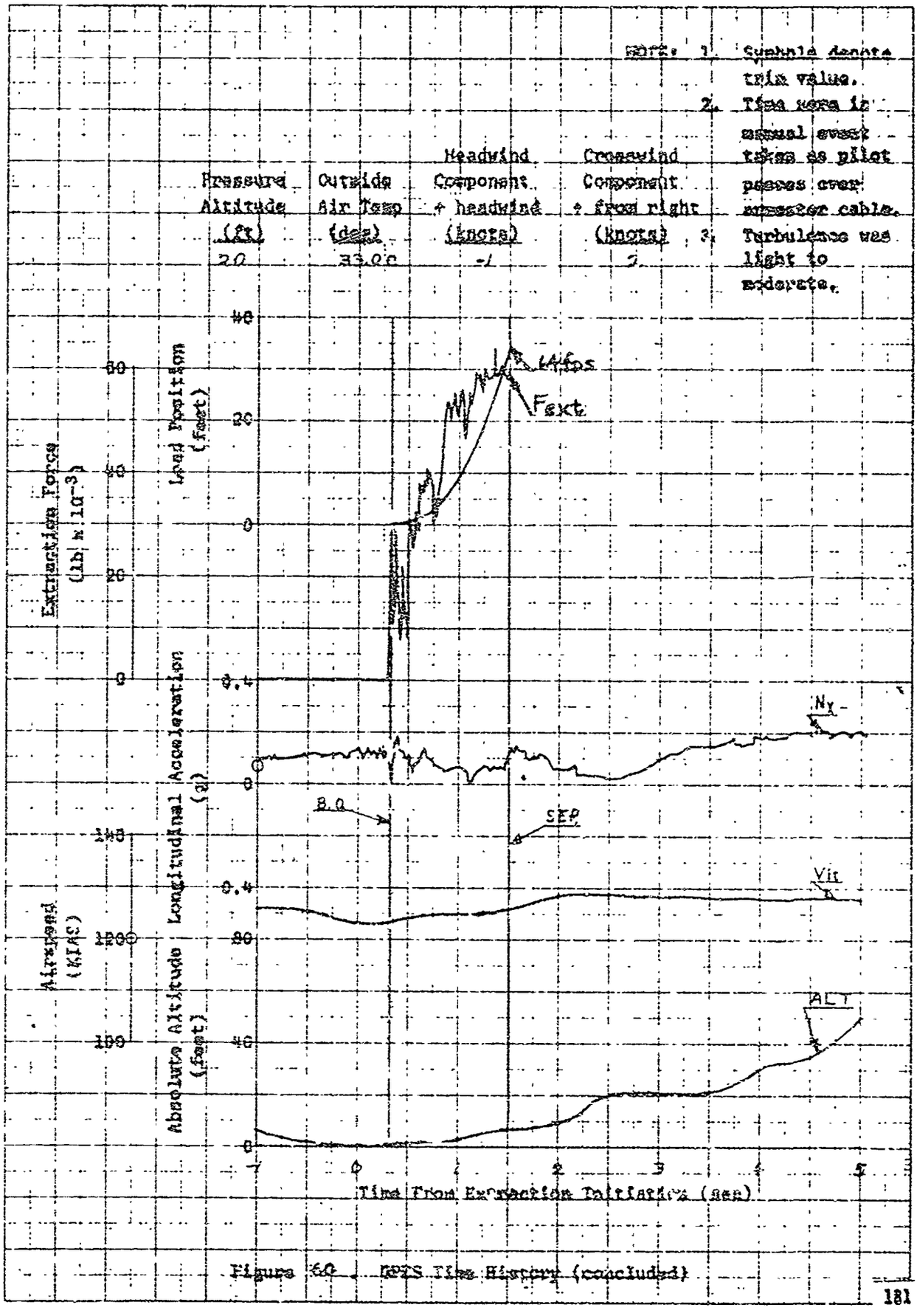


Figure 60. RPTS Time History (concluded)

C-130E USAF S/N 64-0550
A/B32A-4 Rail System
Extraction Number 47

Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (pct MAC)	Airplane cg After Extraction (pct MAC)	Load Weight (lb)	Flap Position (pct)	Elevator Trim Tab Position (deg)
104300	19.9	29.3	24850	70	10 A/U

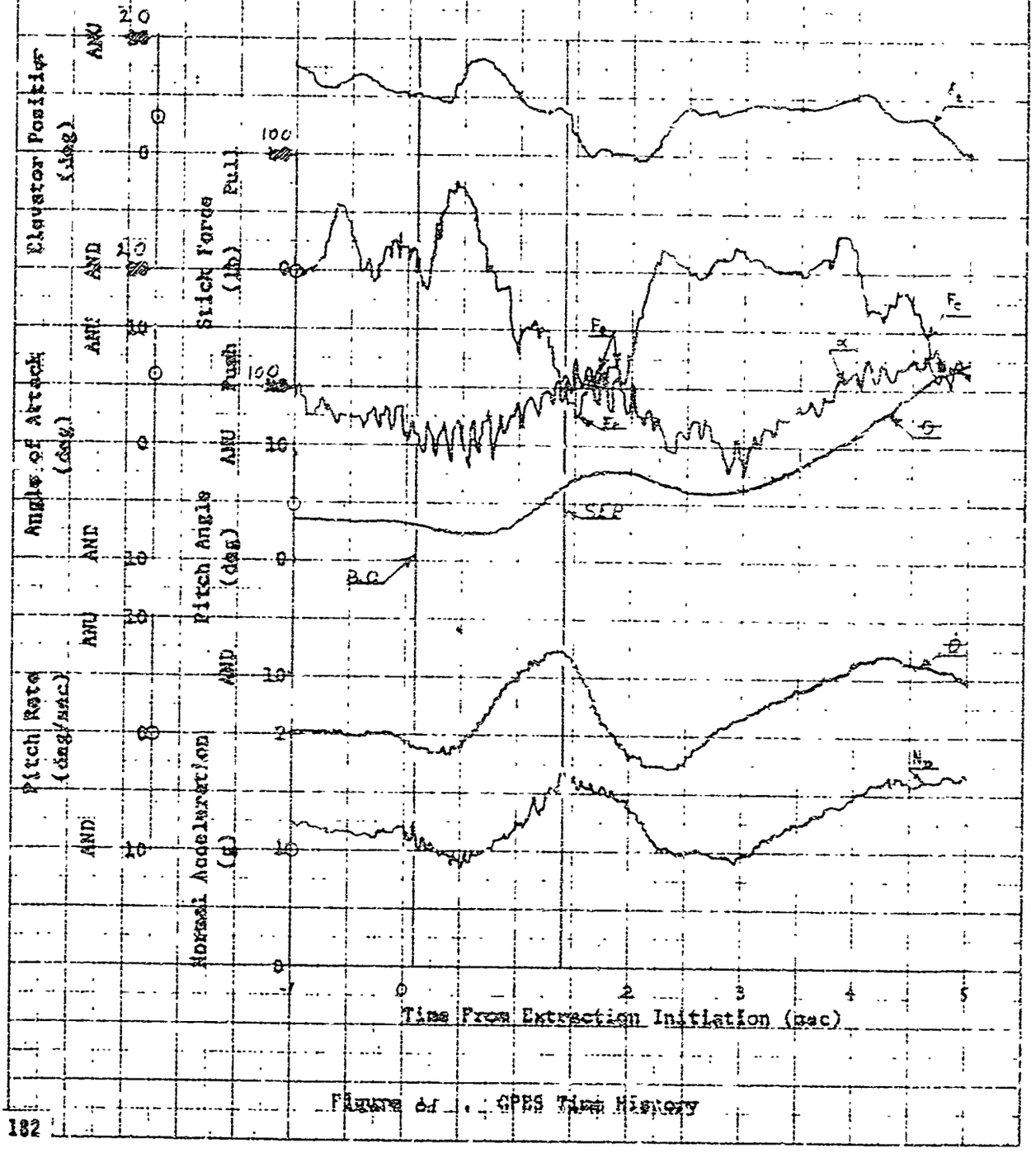
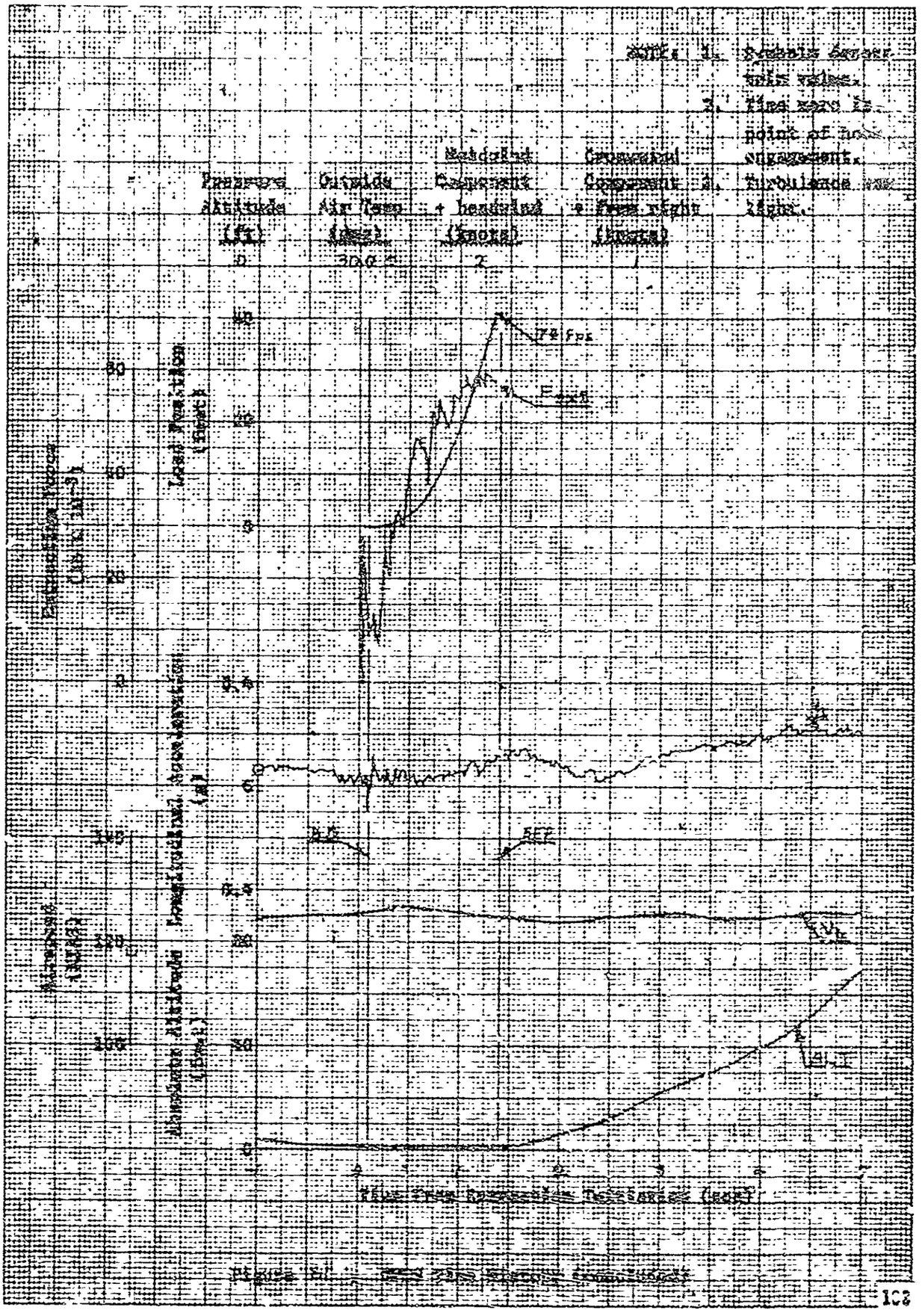


Figure 64. GPES Time History


Pressure altitude (Ft)
Outside Air Temp (deg C)
Headwind Component + headwind (Knots)
Crosswind Component + from right (knots)
Notes: 1. Probable sensor data values.
2. Time zero is point of engagement.
3. Turbulence was light.
Longitudinal Acceleration (g)
Load Position (Inch)
Indicated Airspeed (Knots)
Pressure Altitude (Feet)
Time from Engagement to Touchdown (sec)
Figure 18. Sensor Data Recorded During Engagement

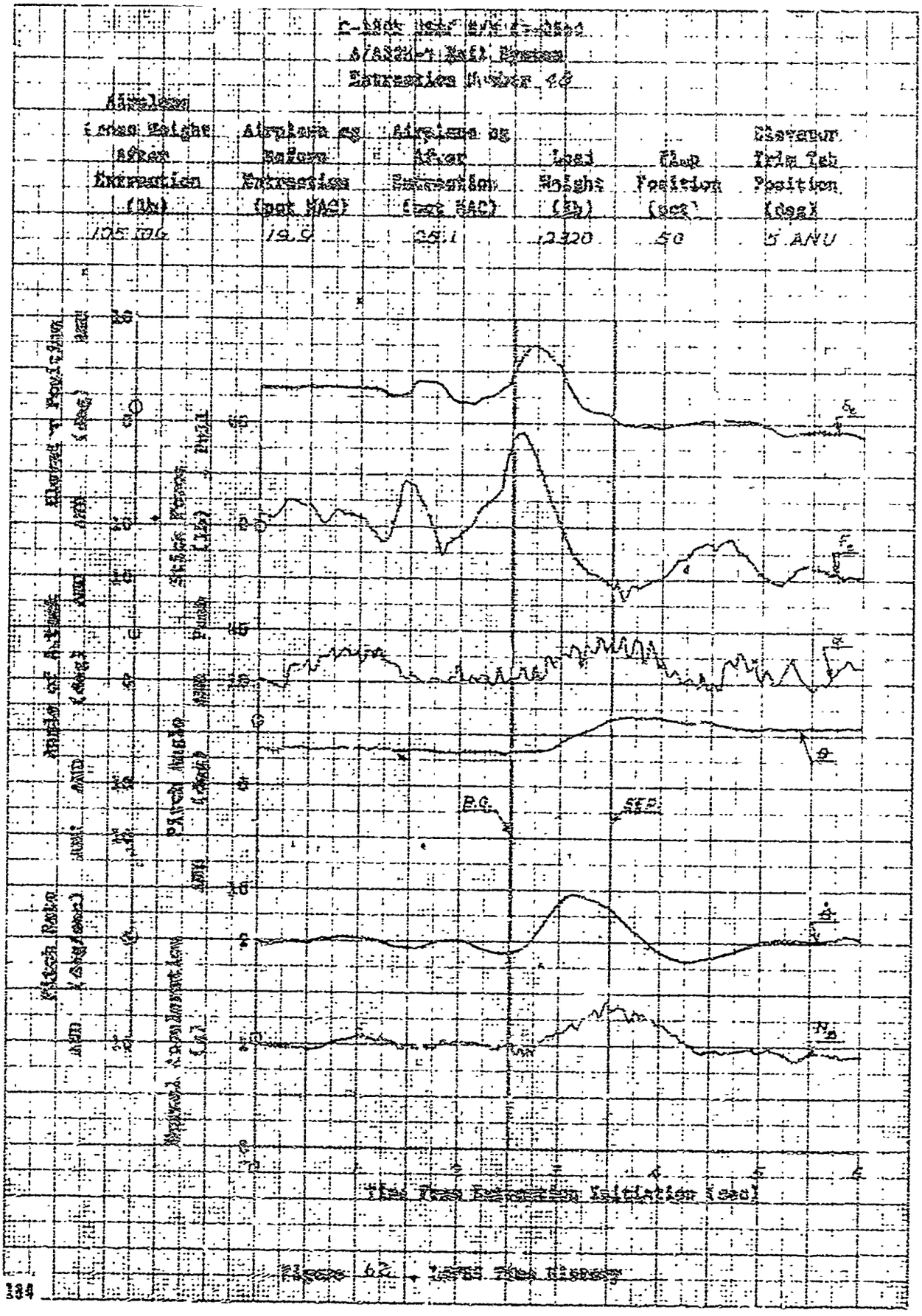
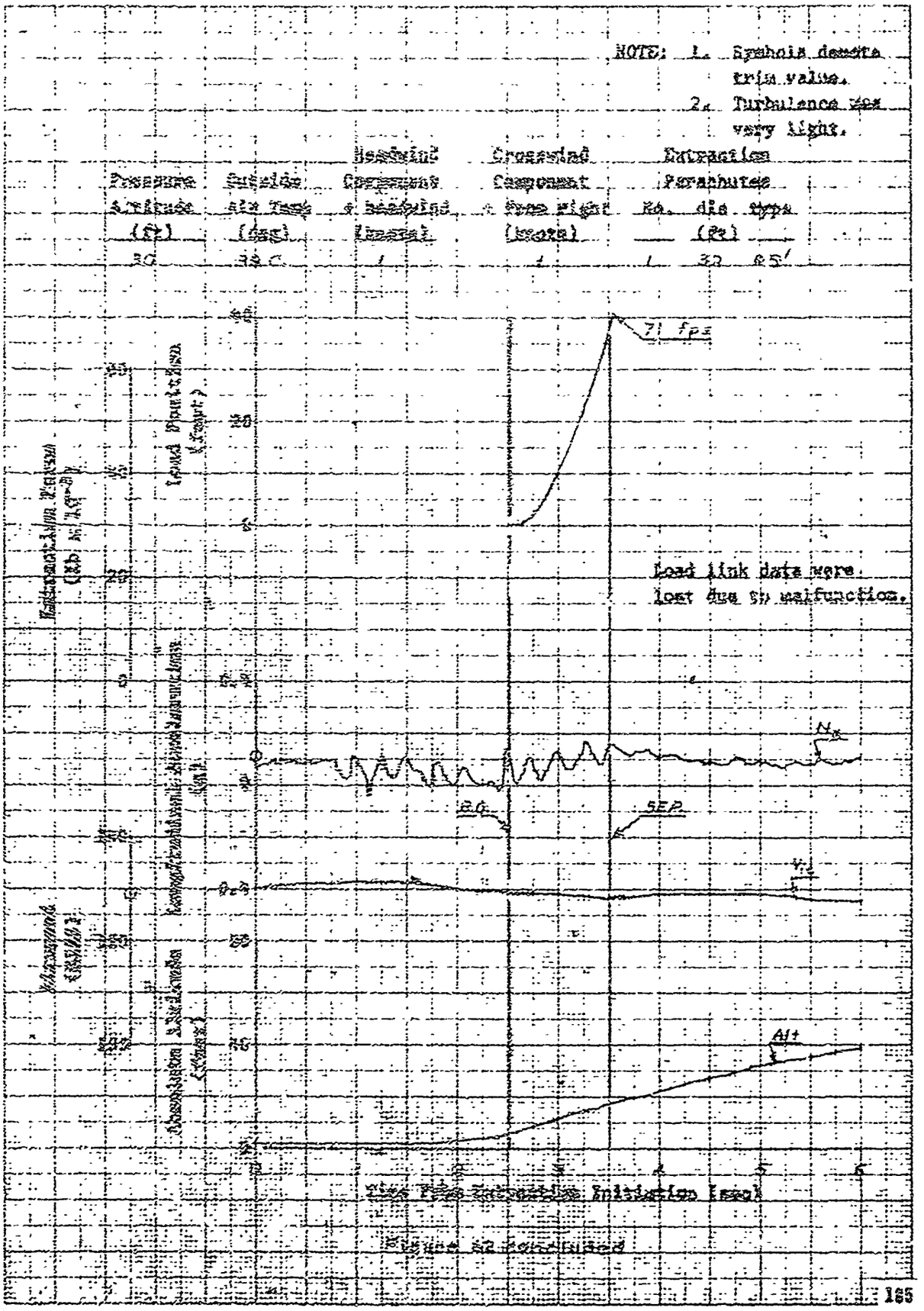


Figure 62. Time Response


NOTE: 1. Symbols denote trim value.
2. Turbulence was very light.
Pressure Altitude (ft)
Outside Air Temp (deg)
Heading Component (knots)
Crosswind Component (knots)
Extraction Parachutes No. dia. type (ft)
30
1
1
1
32 25'
71 fps
Load link data were lost due to malfunction.
E.G.
SEP
Alt
Initiation Level

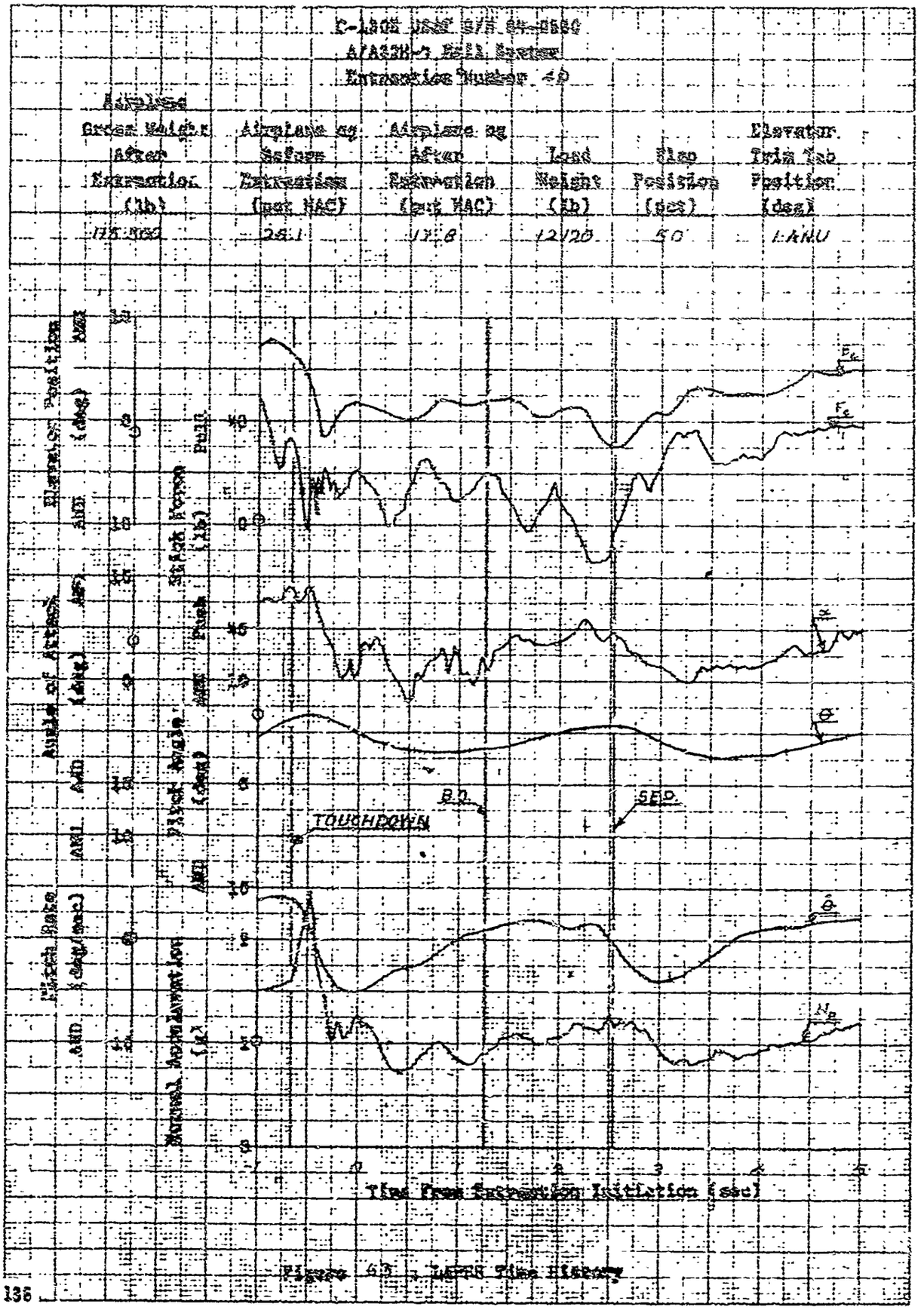


Figure 65.- Latter Time History

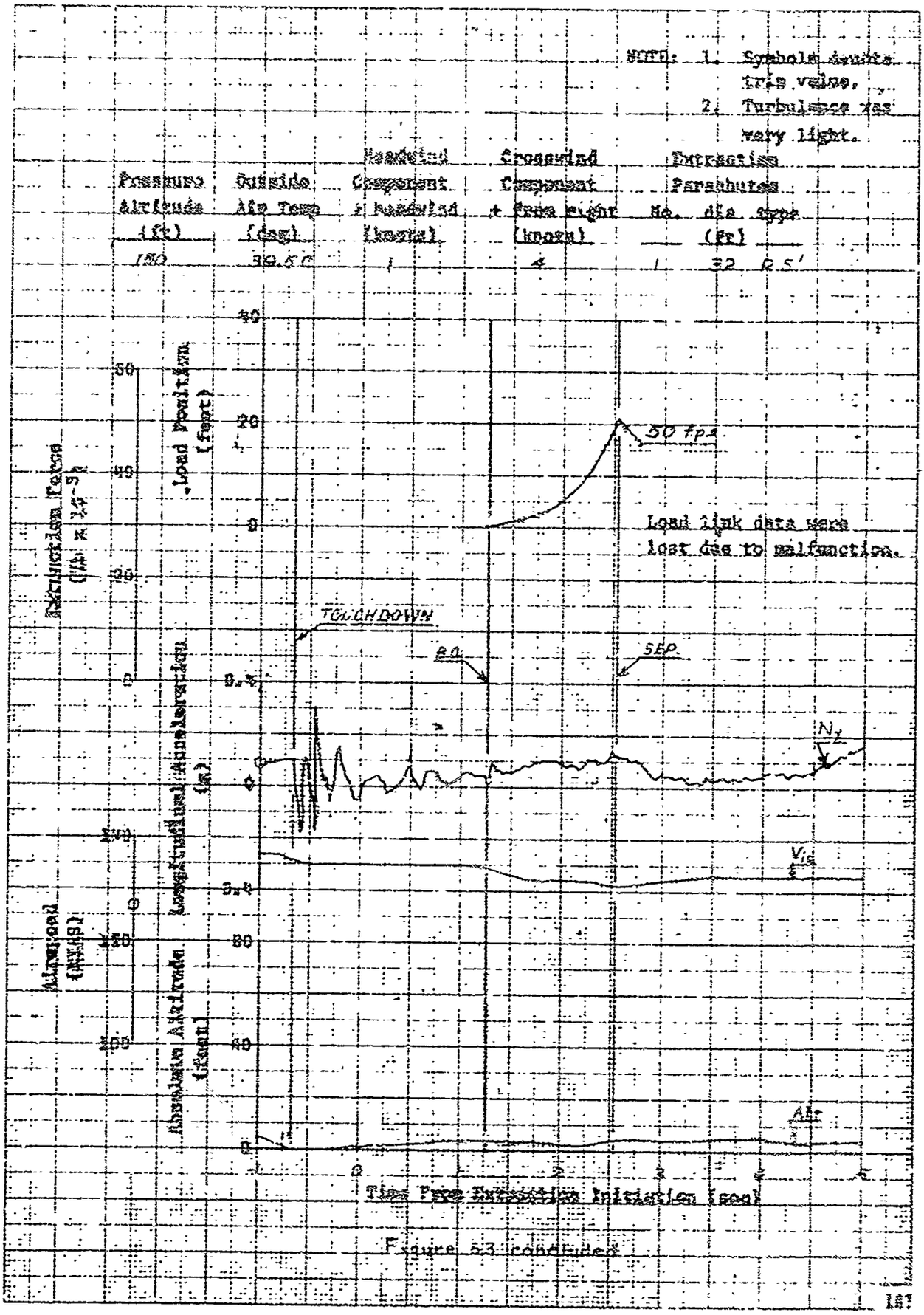


Figure 53 concluded

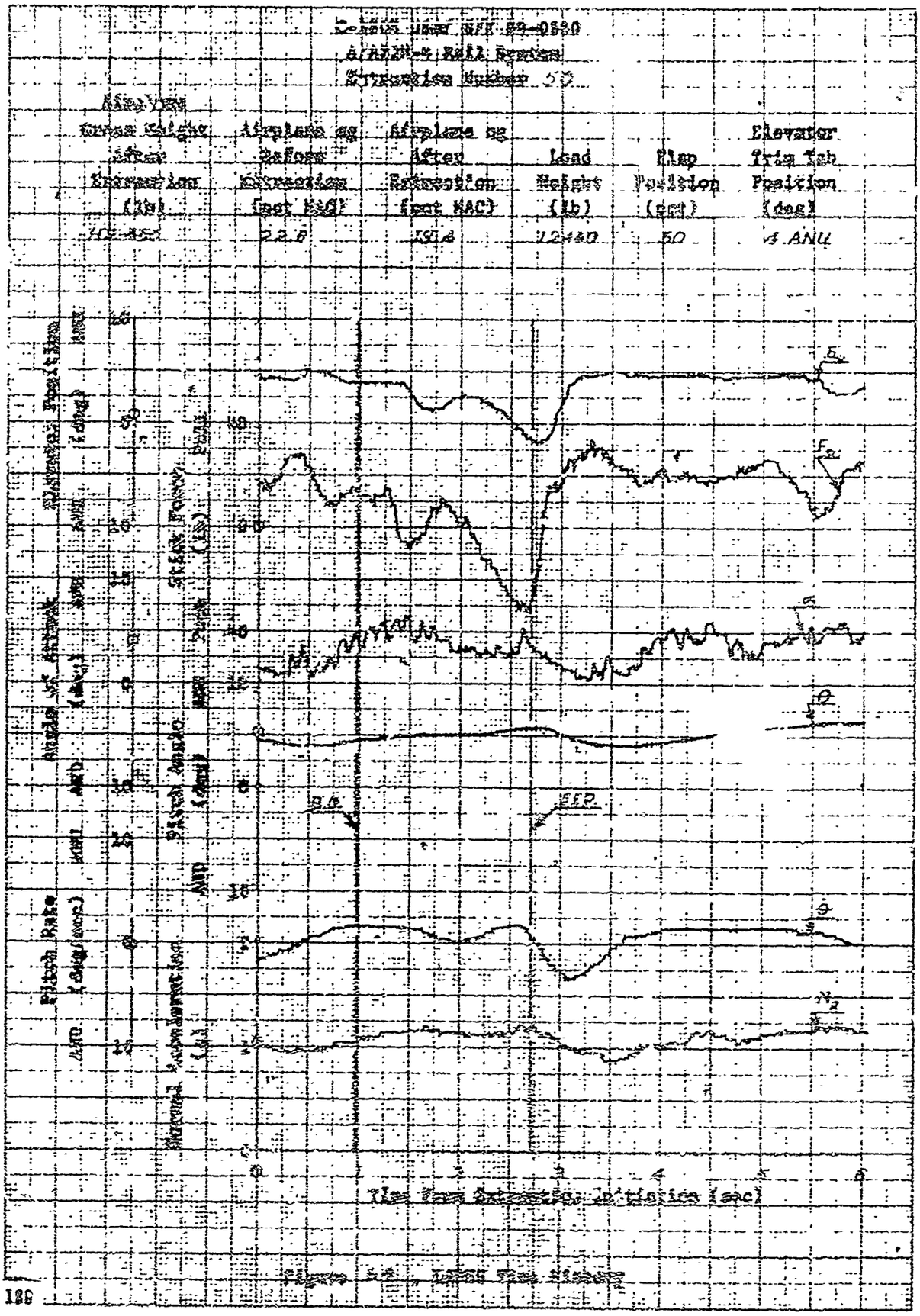


Figure 5-3. Typical Test History

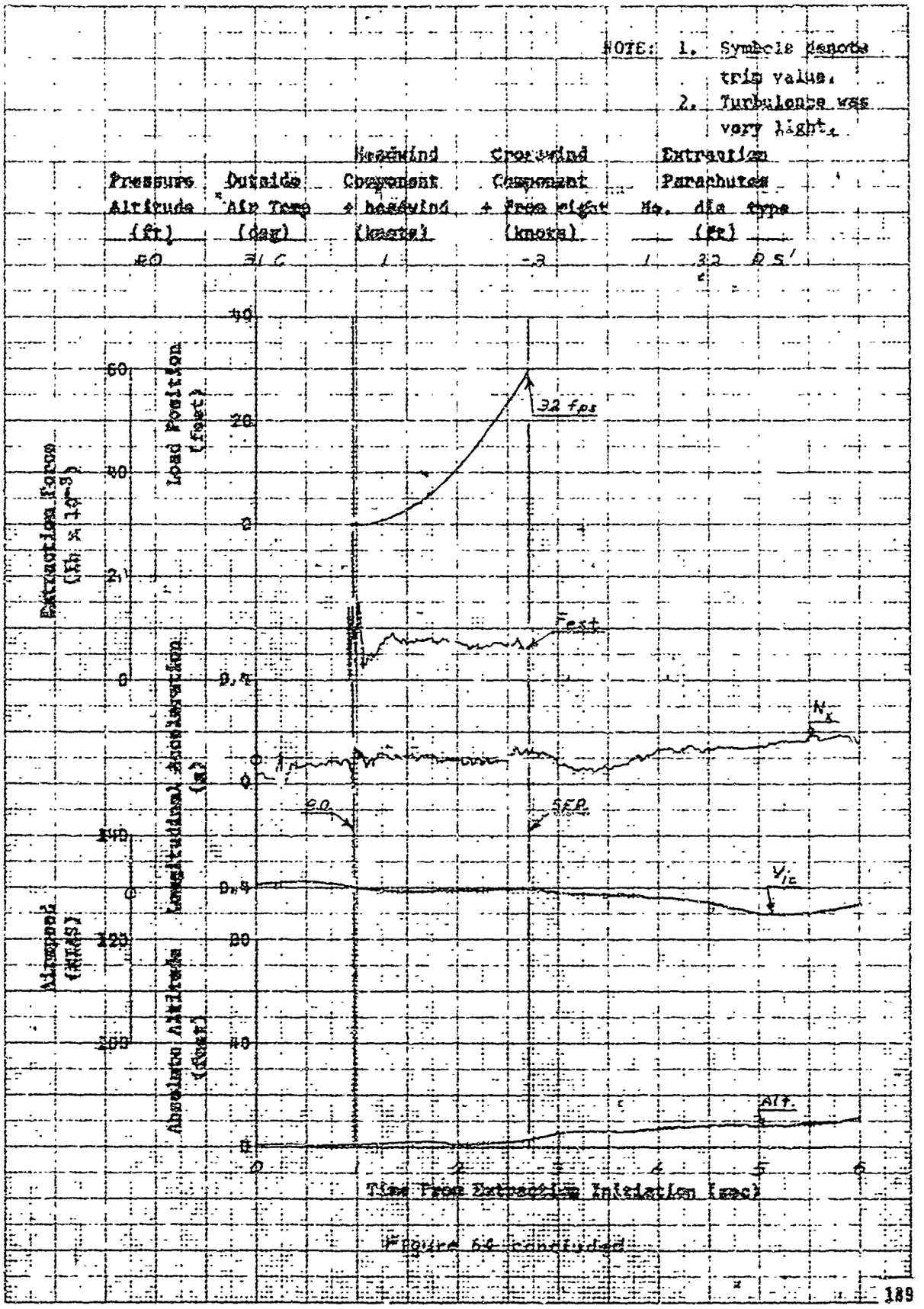


Figure 6.6 continued

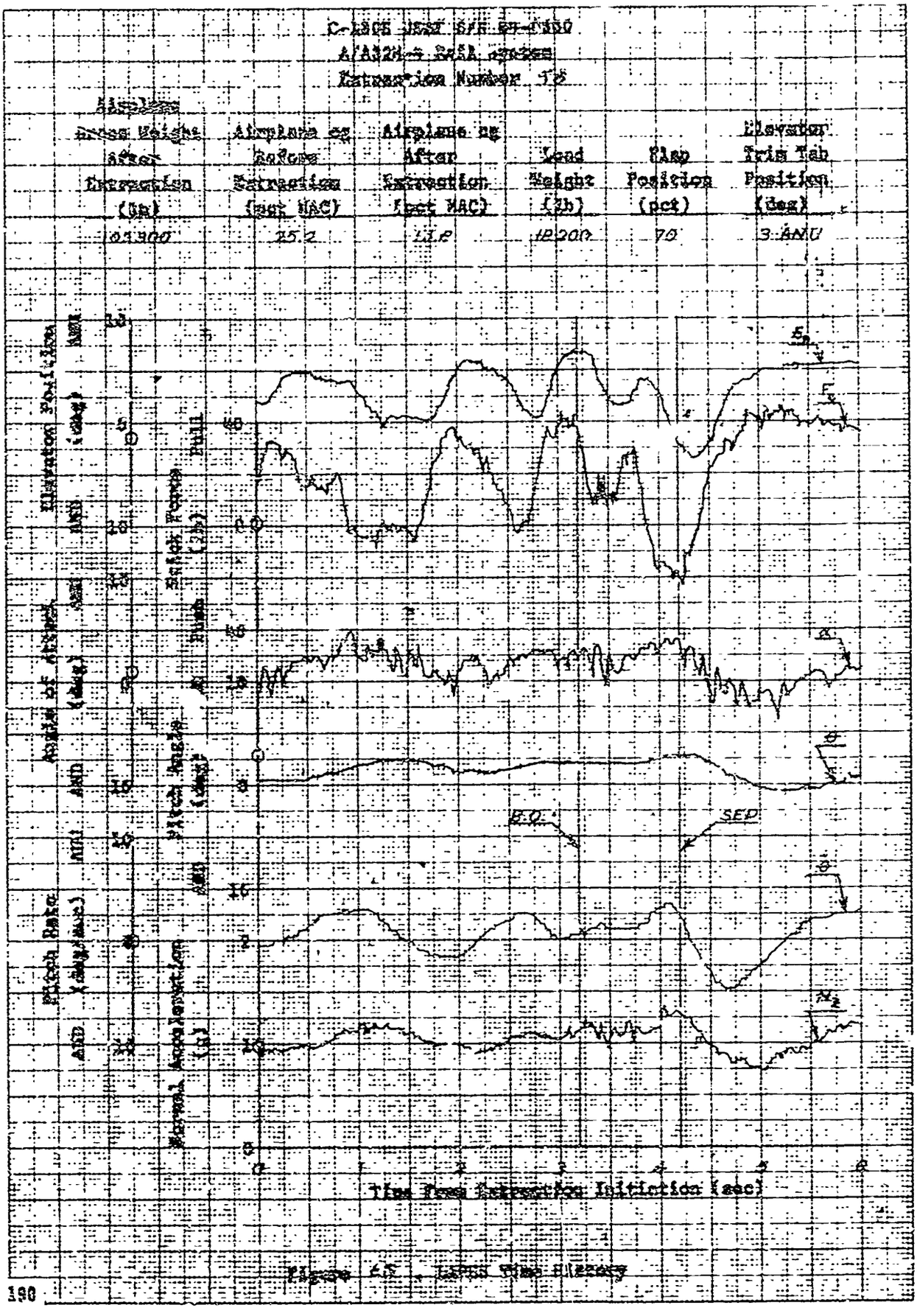


Figure 4.5 . Typical Time History

NOTE: 1. Symbols denote trim values.
2. Turbulence was light.

Pressure Altitude (ft)	Outside Air Temp (deg)	Headwind Component + headwind (knots)	Crosswind Component + from right (knots)	Extraction Parachutes No.	dia	type
4.5	34.0 C	6	1	1	32	R S'
				1	15	R S (DROGUE)

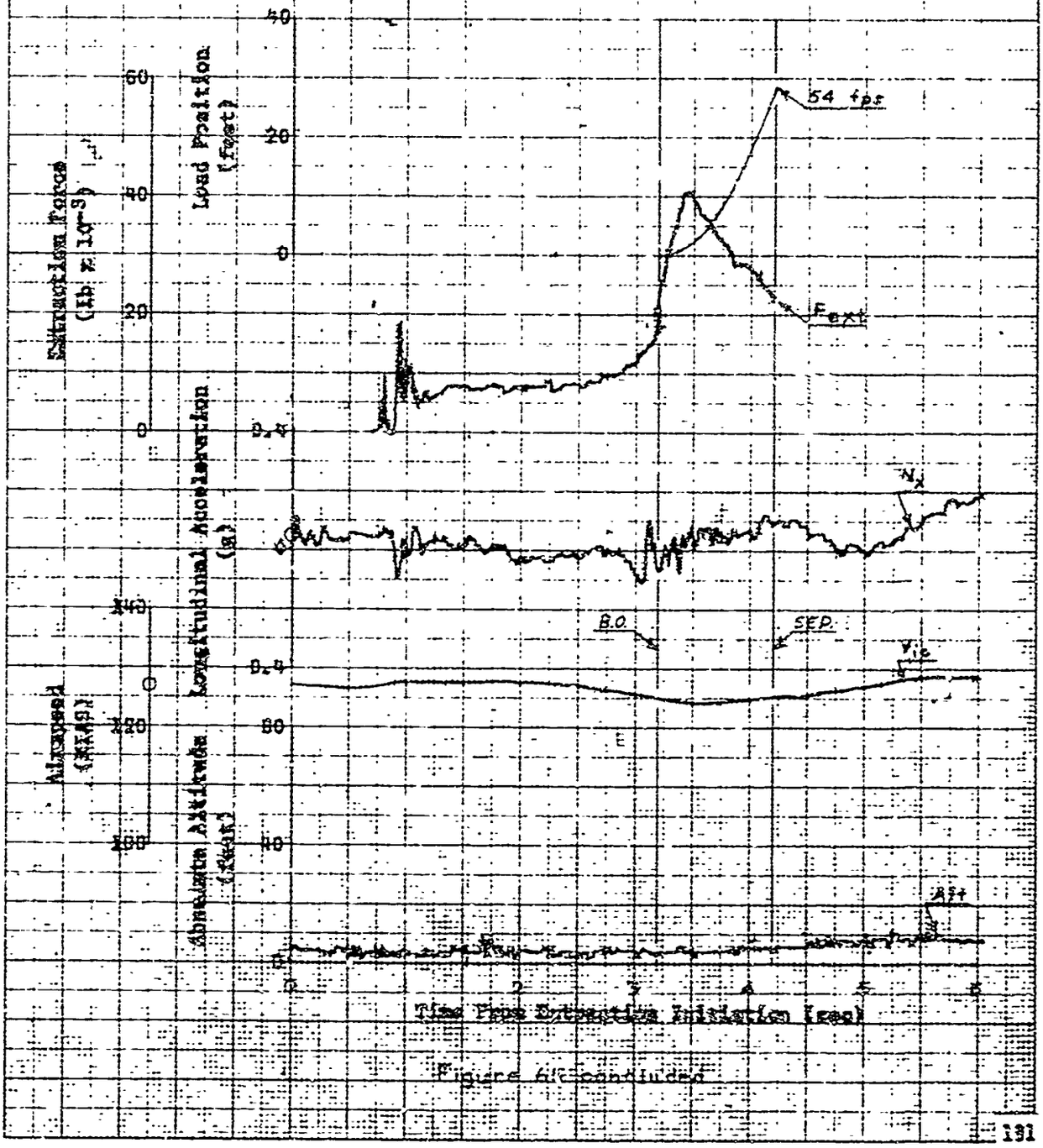


Figure 6.1-continued

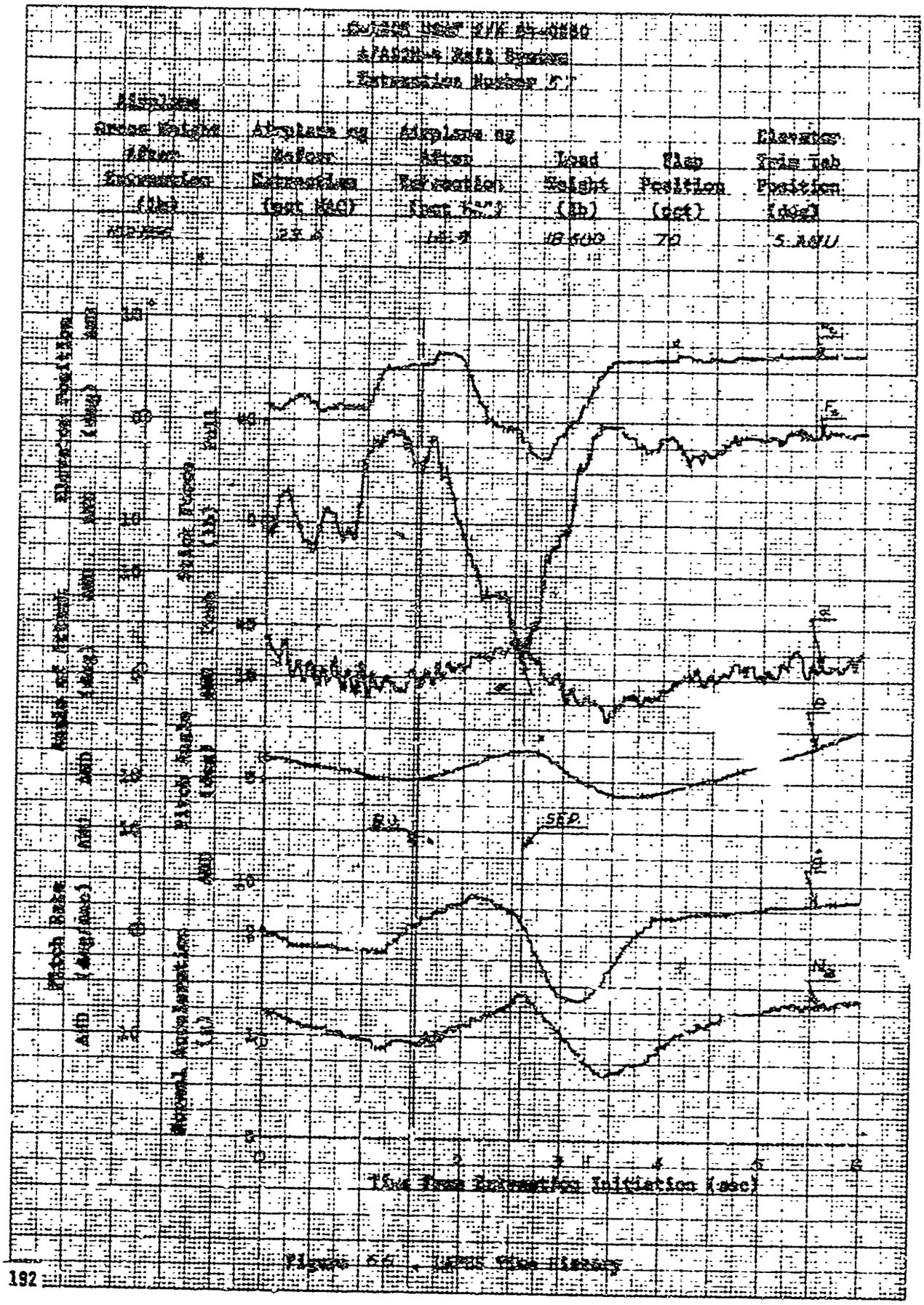


Figure 6-6. Typical Flight Record

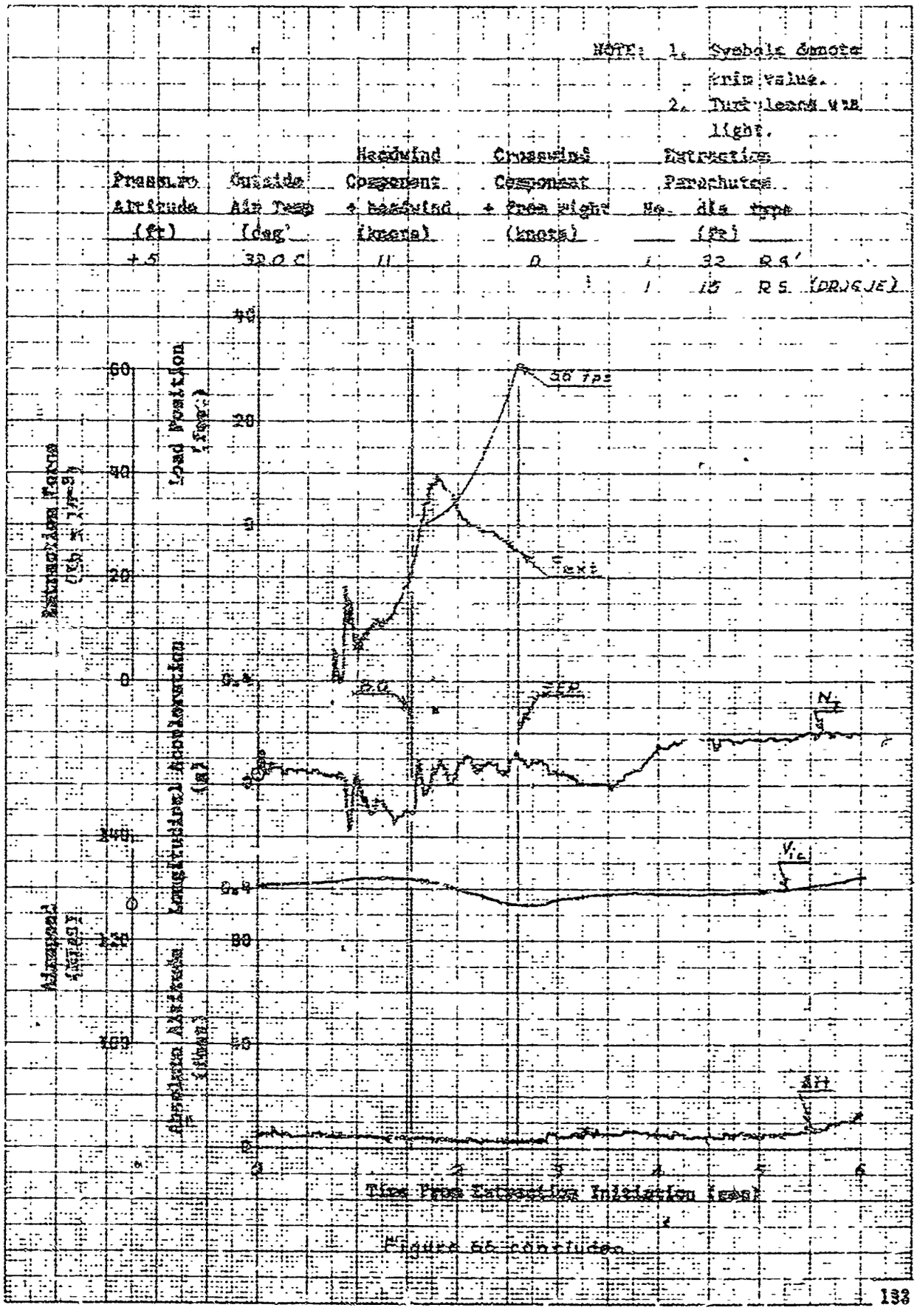


Figure 66 concluded.

C-130E (CAF S/N 64-0560)
A/A32H-4 Rail System
Extraction Number 5B

Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (pct MAC)	Airplane cg After Extraction (pct MAC)	Load Weight (lb)	Flap Position (pct)	Elevator Trim Tab Position (deg)
104 000	16.8	23.1	18 450	70	7 ANU

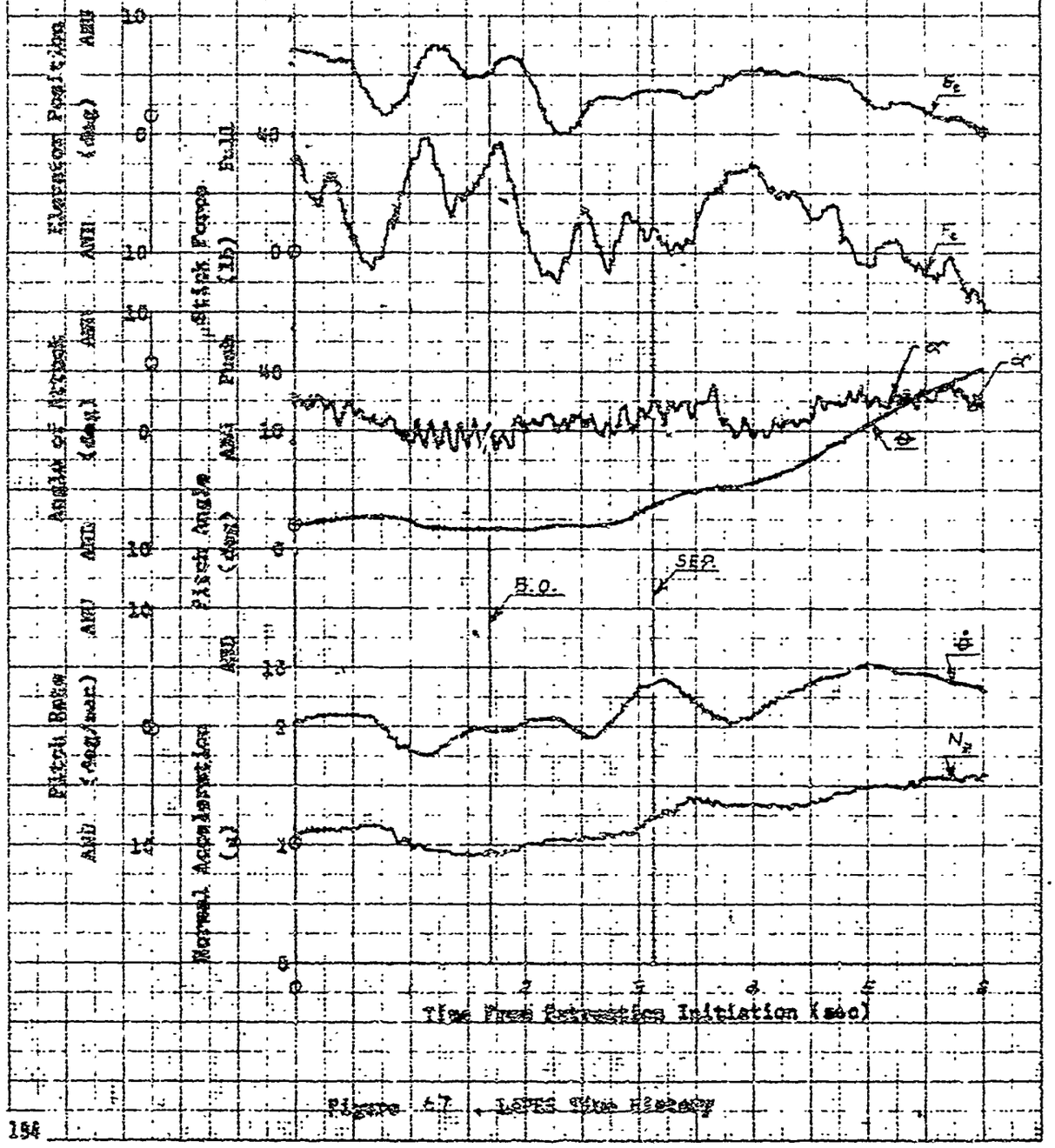


Figure 67. Load Time History

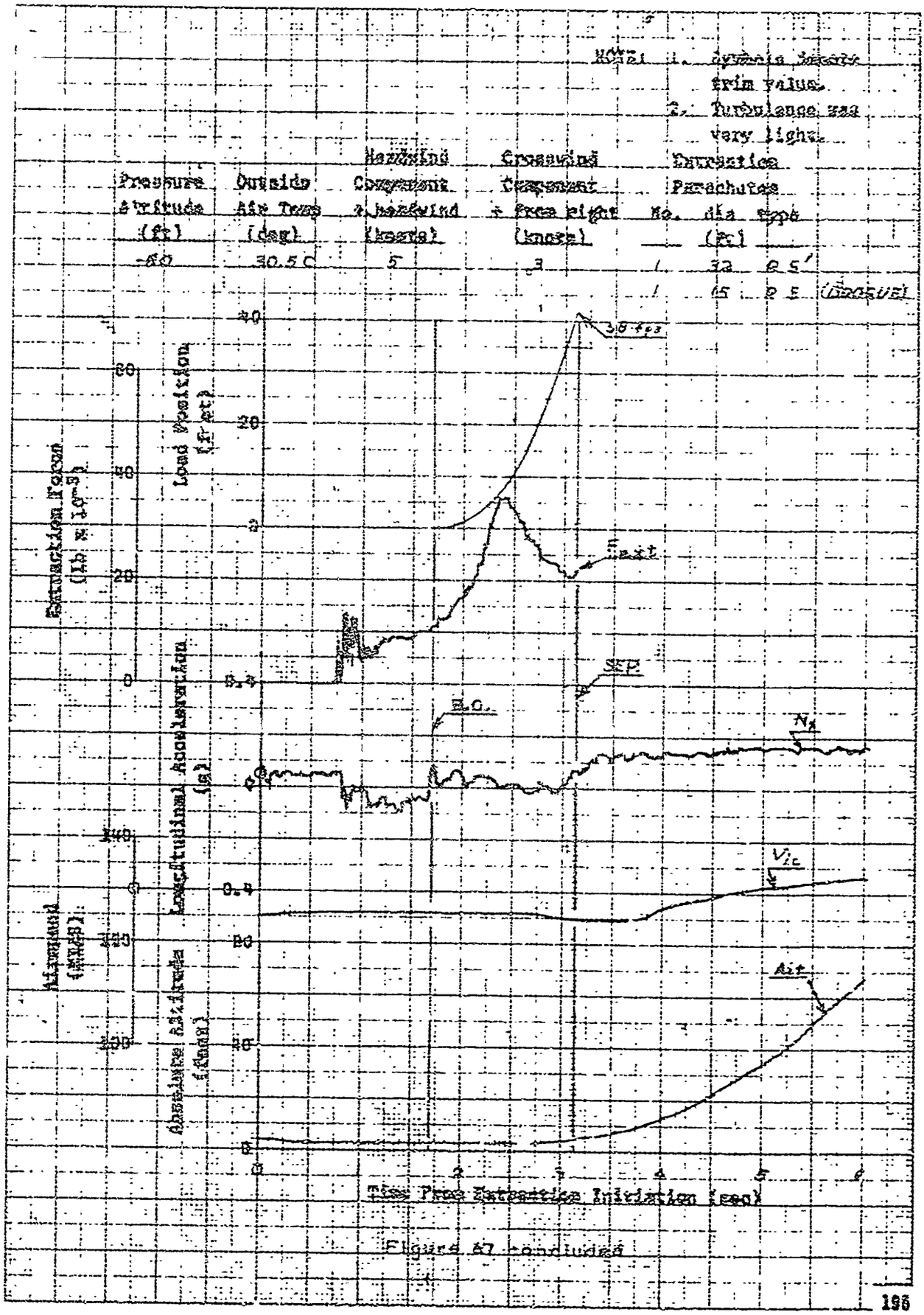


Figure 47 concluded

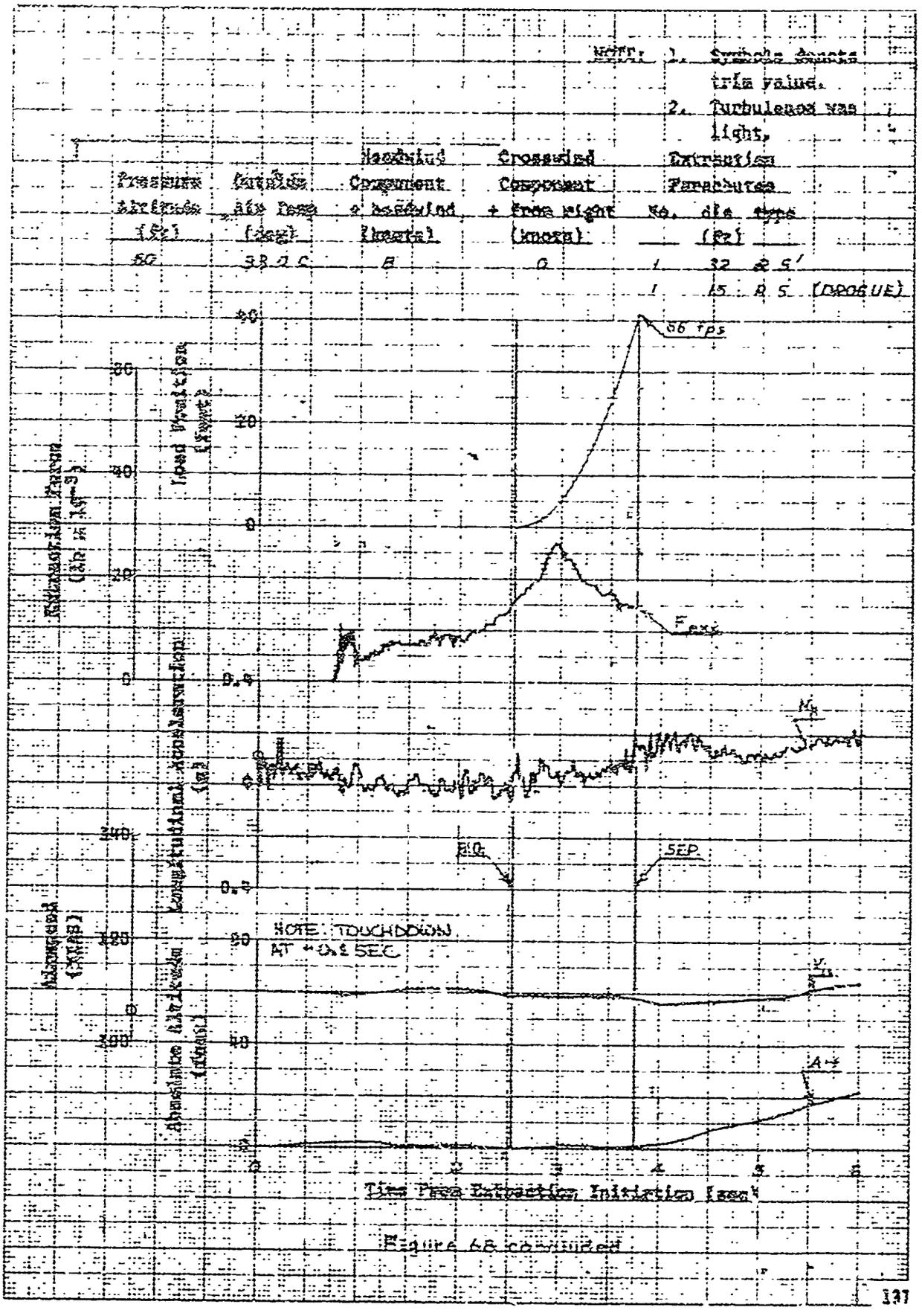


Figure 68 continued

C-130E [illegible] S/N 64-0560
A/A37H-4 Ball Bearing
Extraction Number 60

Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (pct MAC)	Airplane cg After Extraction (pct MAC)	Load Weight (lb)	Flap Position (pct)	Elevator Trim Tab Position (deg)
104,000	15.7	25.5	11,950	70	5 AUP

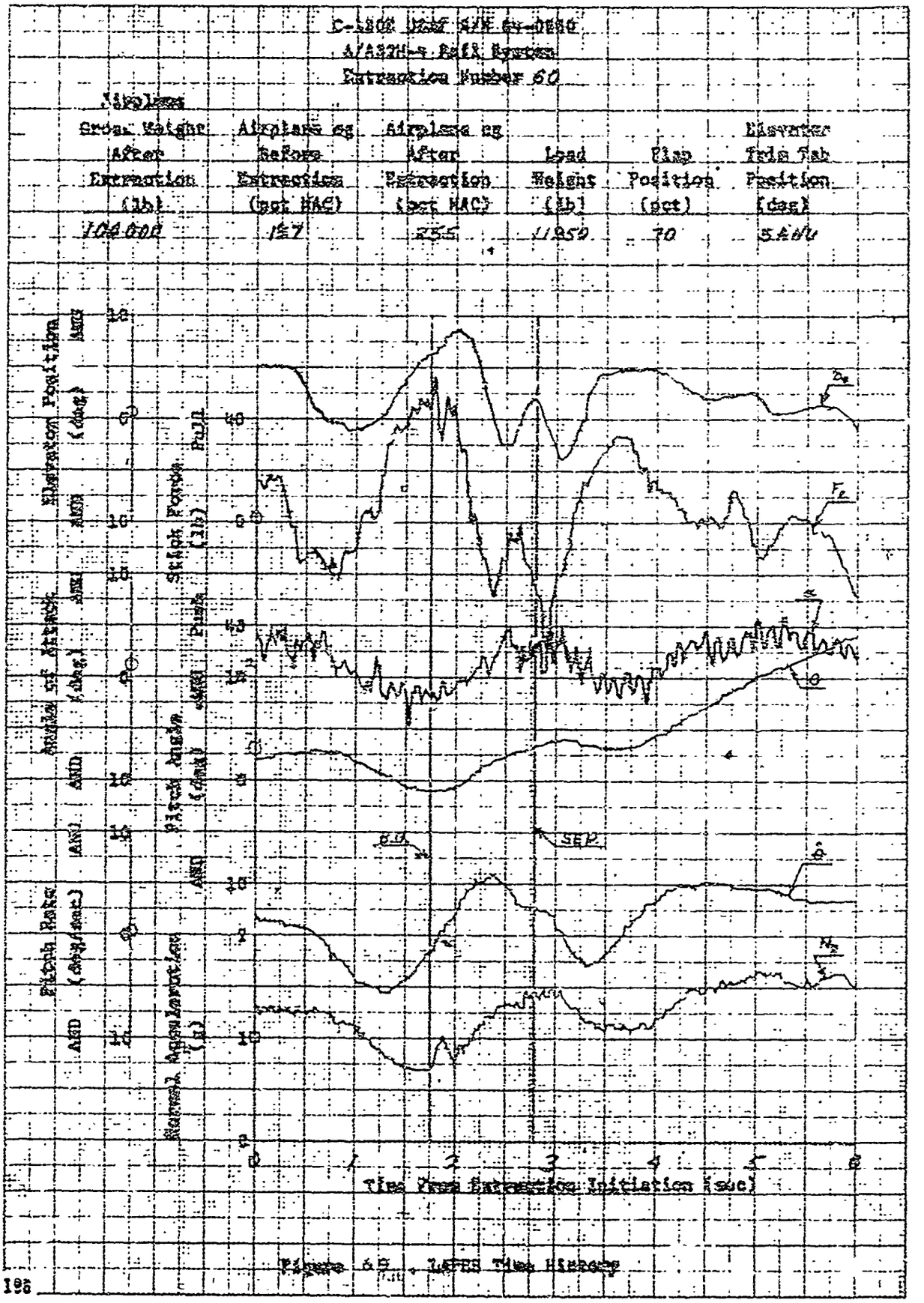


Figure 6-[illegible]. Latter Time History

NOTE: 1. Systole counts take value.
2. Turbulence was light to moderate.

Pressure Altitude (ft)	Outside Air Temp (deg)	Resulting Component + headwind (knots)	Crosswind Component + from right (knots)	Intervalometer Parachutes No. dia type (ft)
-55	27.5 C	14	-5	1 32 G S
				1 15 G S (DECAYE)

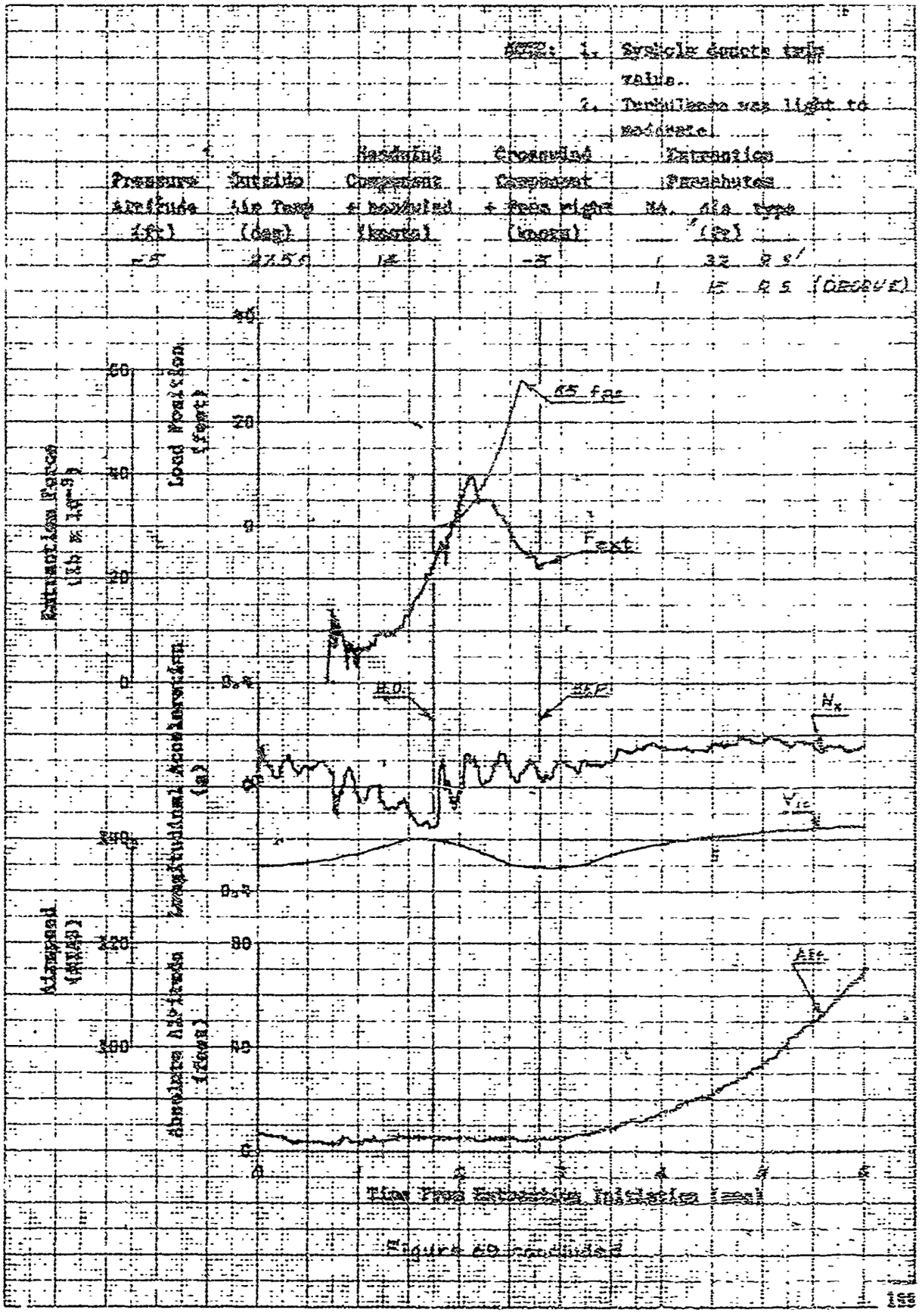
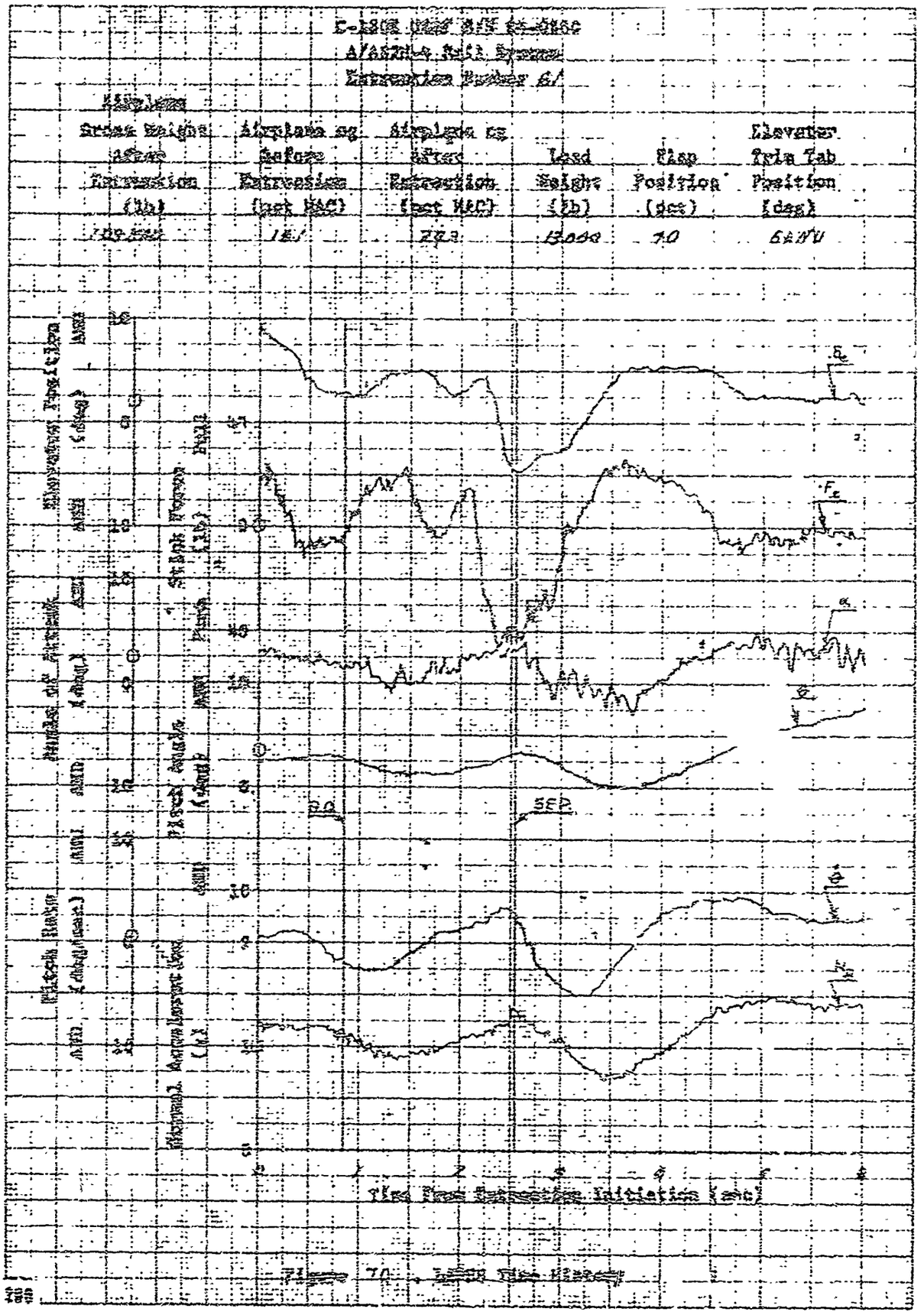


Figure 20 concluded


Airplane
Gross Weight
Before
Extension
(lb)
Airplane cg
Before
Extension
(per MAC)
Airplane cg
After
Extension
(per MAC)
Load
Weight
(lb)
Flap
Position
(deg)
Elevator
Trim Tab
Position
(deg)
Time From Extension Initiation (sec)

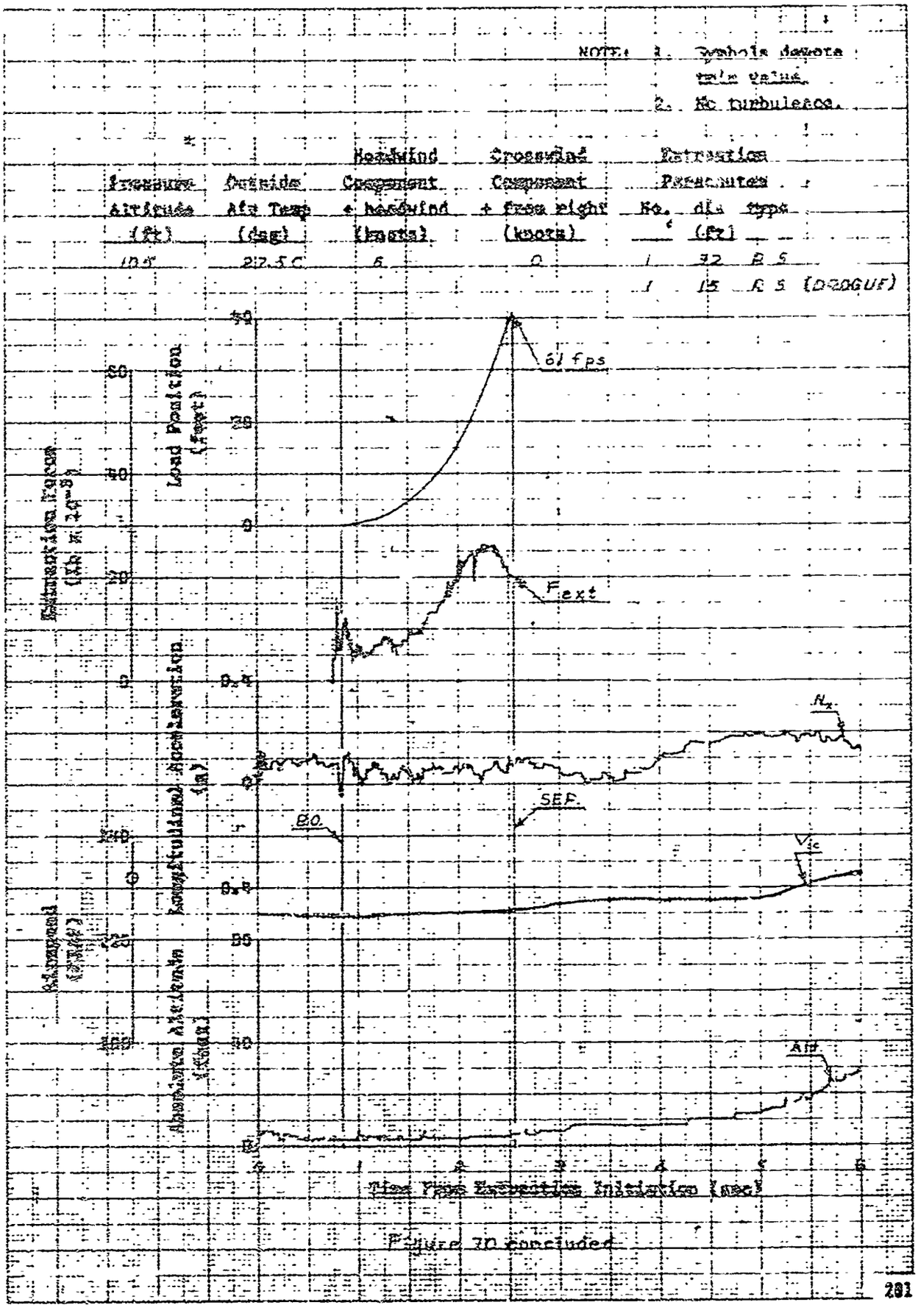


Figure 70 concluded

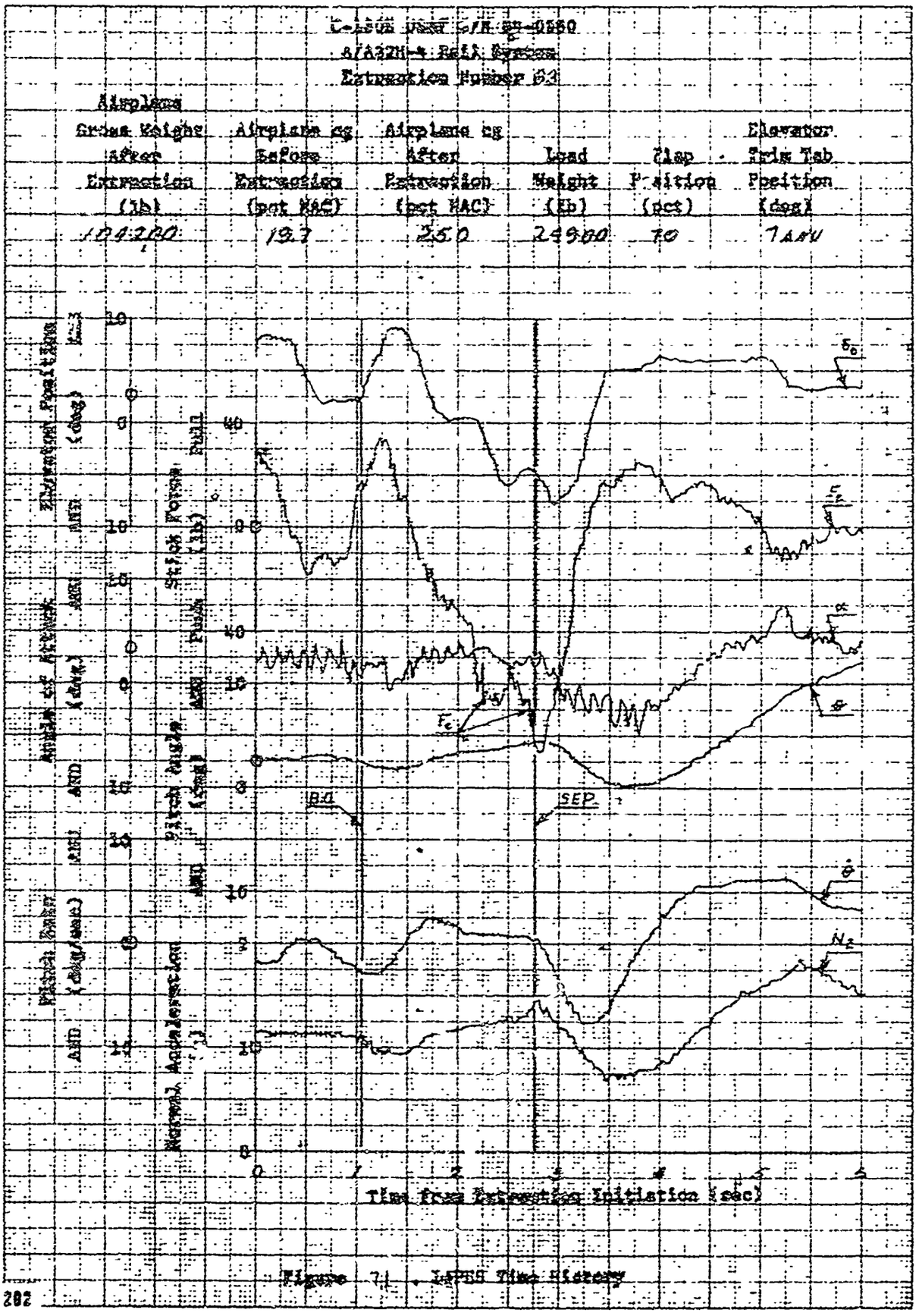


Figure 71. LaRCSS Time History

NOTE: 1. Symbols denote trim value.
2. Turbulence was light.

Pressure Altitude (ft)	Outside Air Temp (deg)	Headwind Component, + headwind (knots)	Crosswind Component + from right (knots)	Extraction Parachutes No.	dia type (ft)
120	32 C	-2	2	2	52 R S'
				1	15 R S (DROGUE)

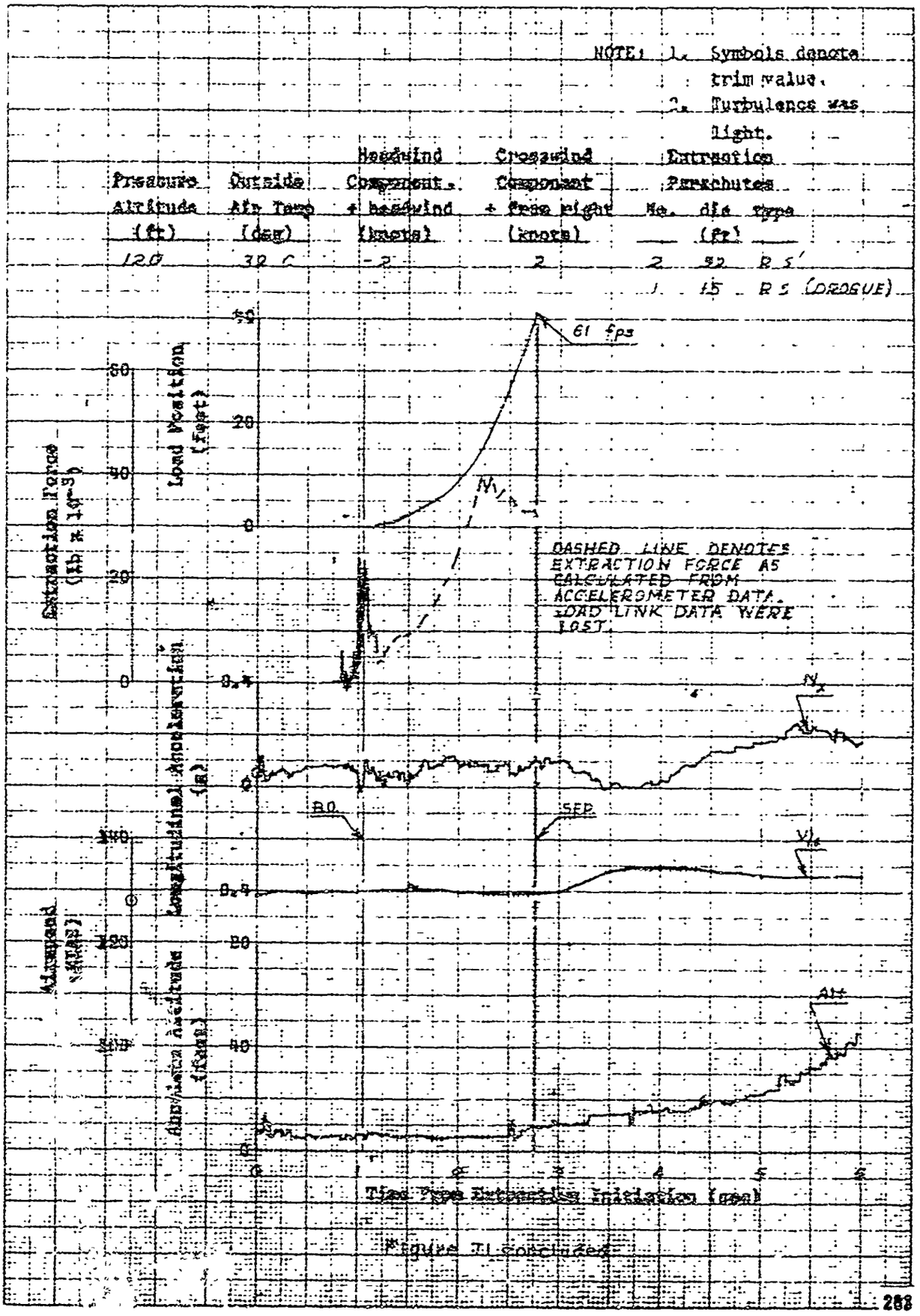


Figure 31 Concluded

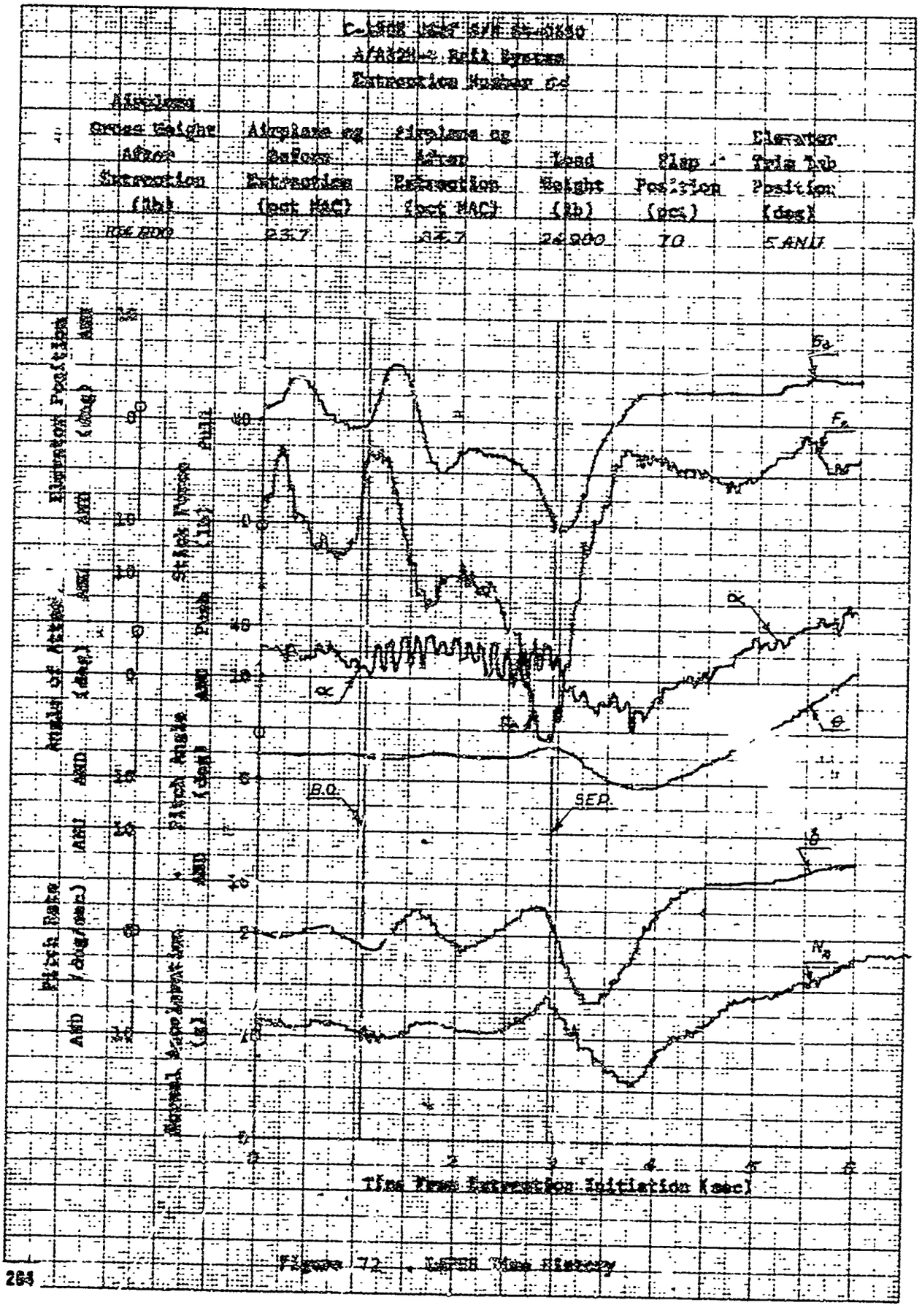


Figure 72. [illegible] Time History

NOTE: 1. Symbols denote trim value.
2. Turbulance was very light.

Pressure Altitude (ft)	Outside Air Temp (deg)	Headwind Component + headwind (knots)	Crosswind Component + from right (knots)	Extraction Parachutes No.	dia type (ft)
5	32.0 C	0	0	2	32 R.S.
				1	15 R.S (DROGUE)

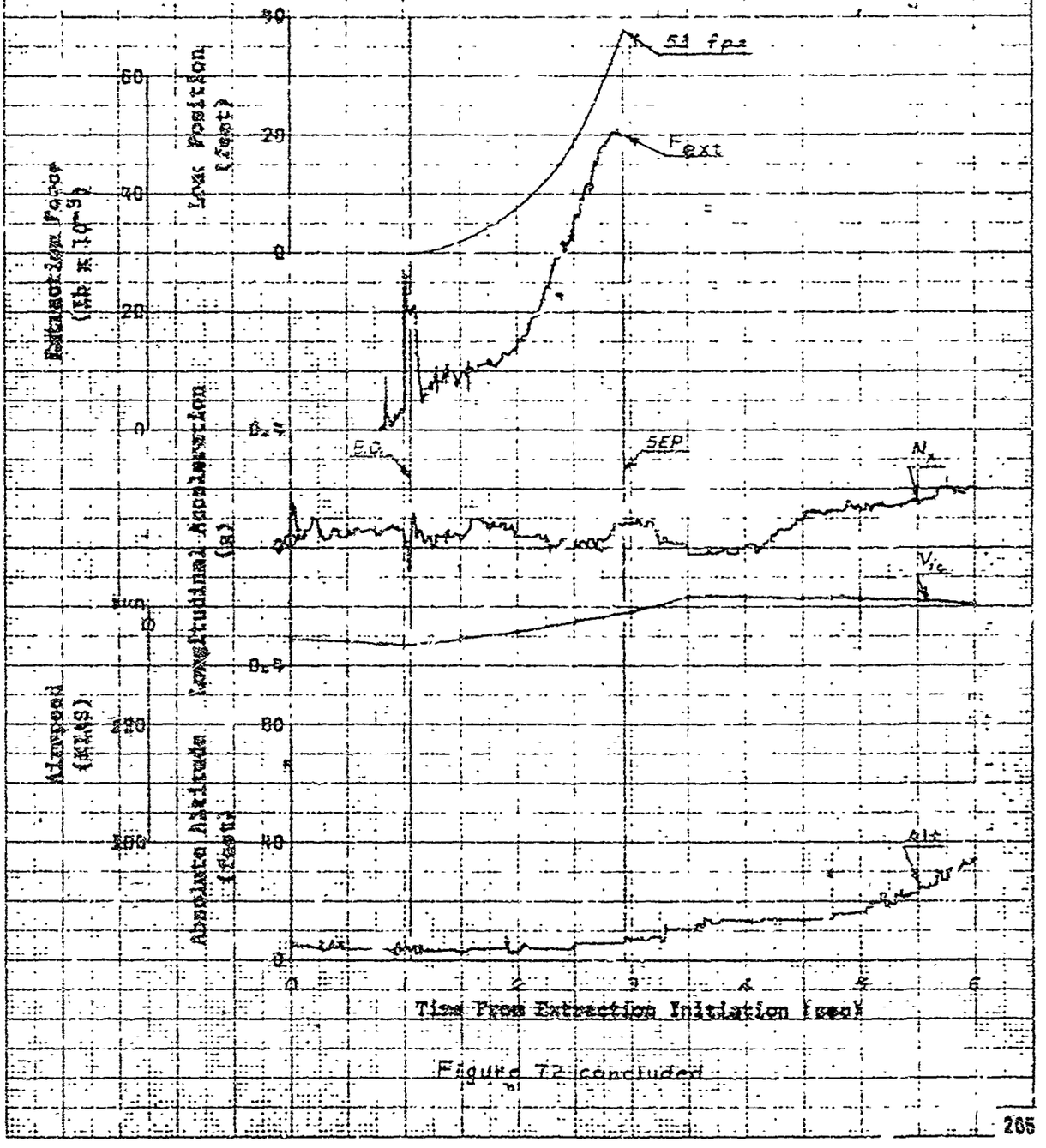


Figure 72 concluded

Time from Initiation (sec)

Figure 7. [illegible]

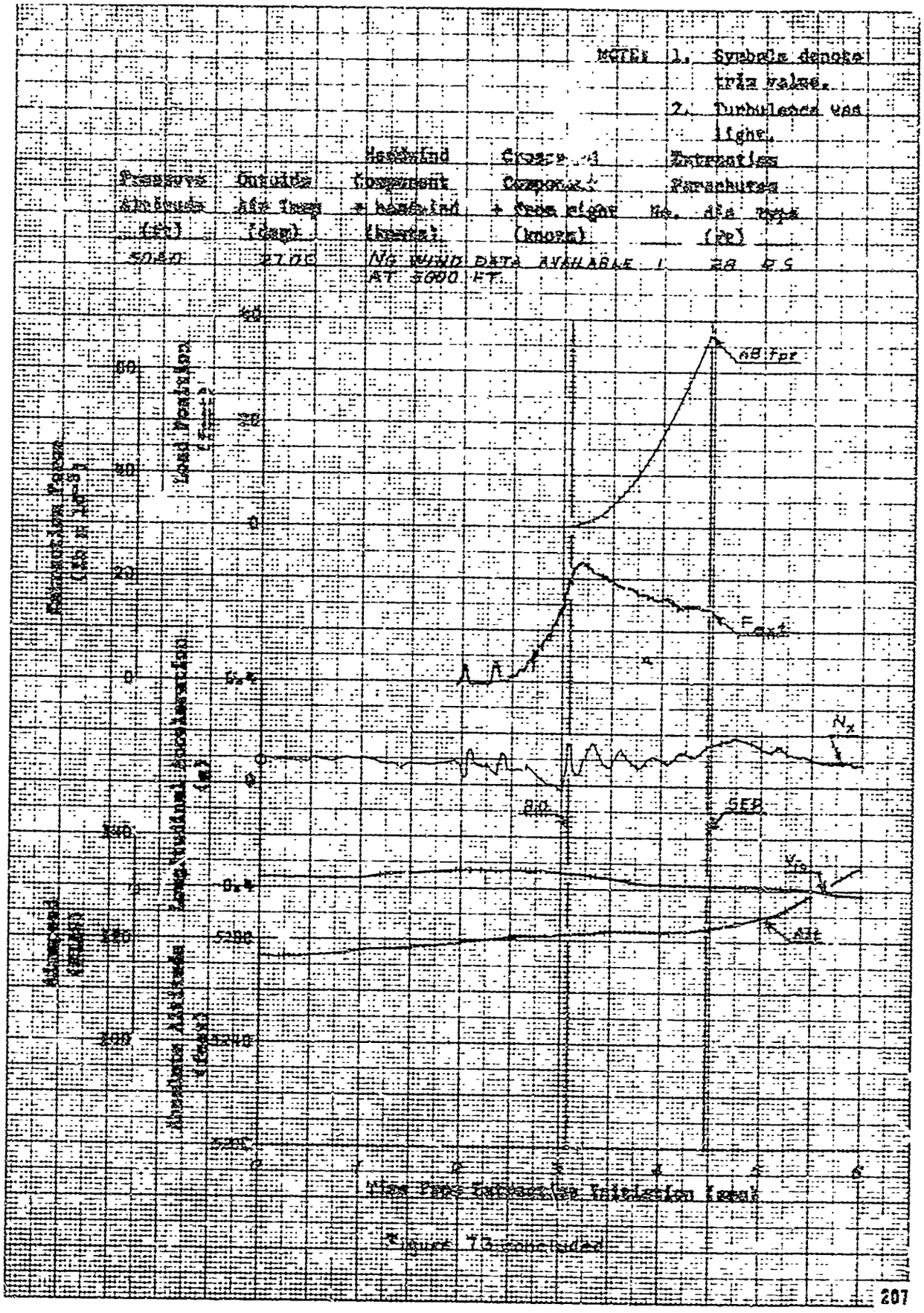


Figure 73 concluded

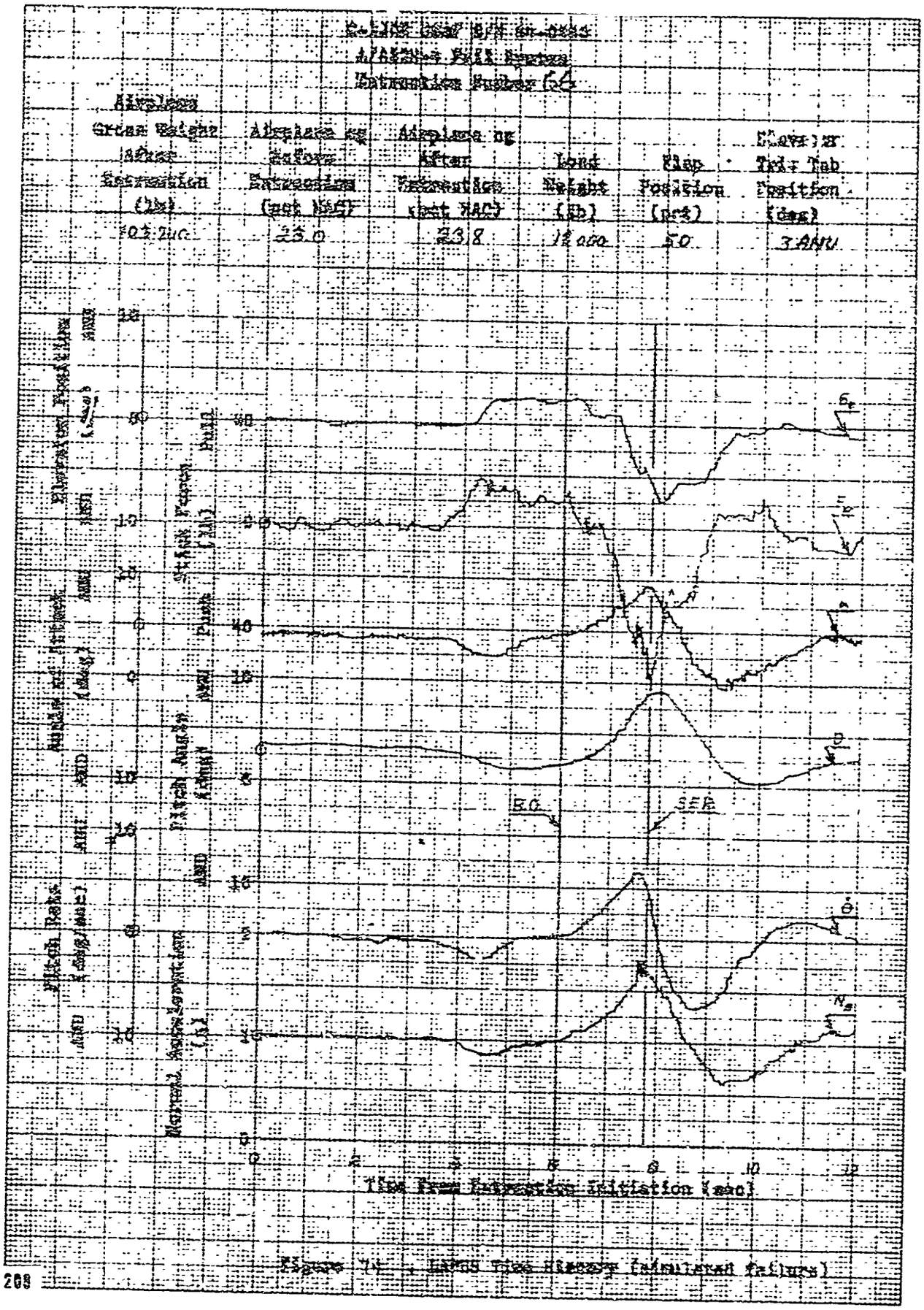


Figure 14. - LAMS Time History (Jettison Failure)

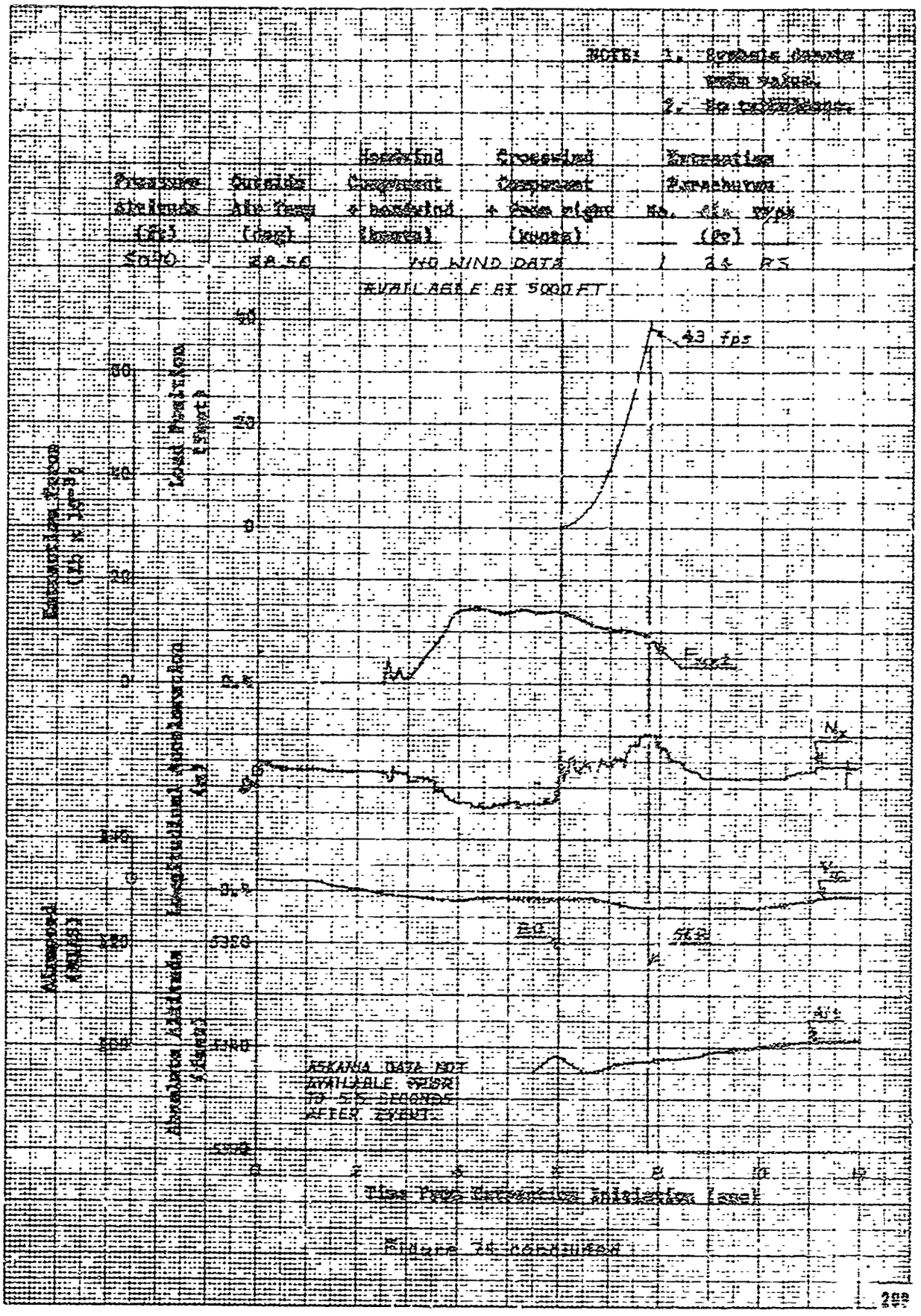


Figure 24 (continued)

Airborne Data System

Extraction Number 67

Airplane gross weight after extraction (lbs)	Airplane cg before extraction (pct MAC)	Airplane cg after extraction (pct MAC)	Load Weight (lb)	Flap Position (pct)	Elevator Trim Tab Position (deg)
101 730	23.7	24.6	12 500	50	2.4 NU

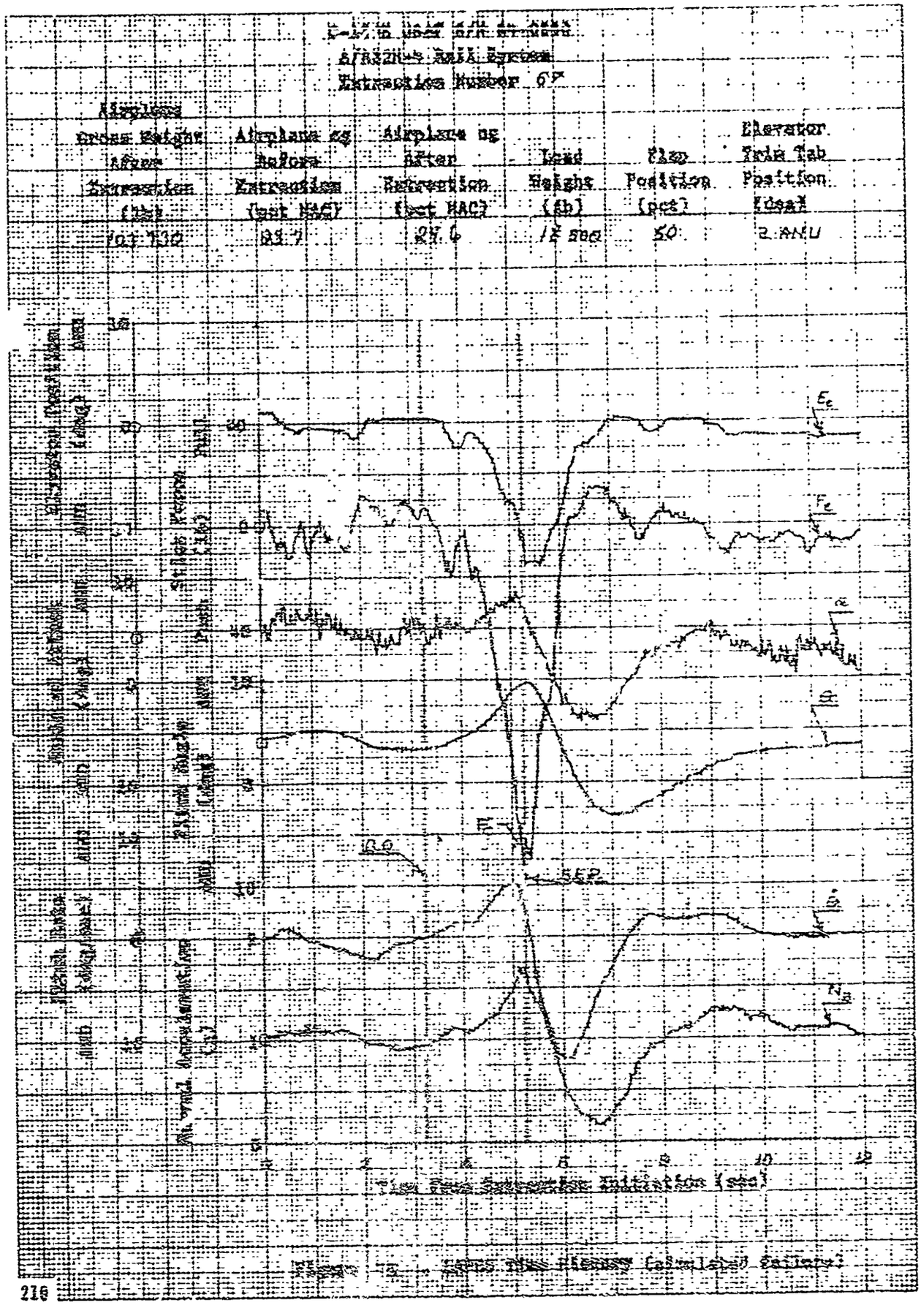


Figure 12. Cargo Load Release Calculated Results

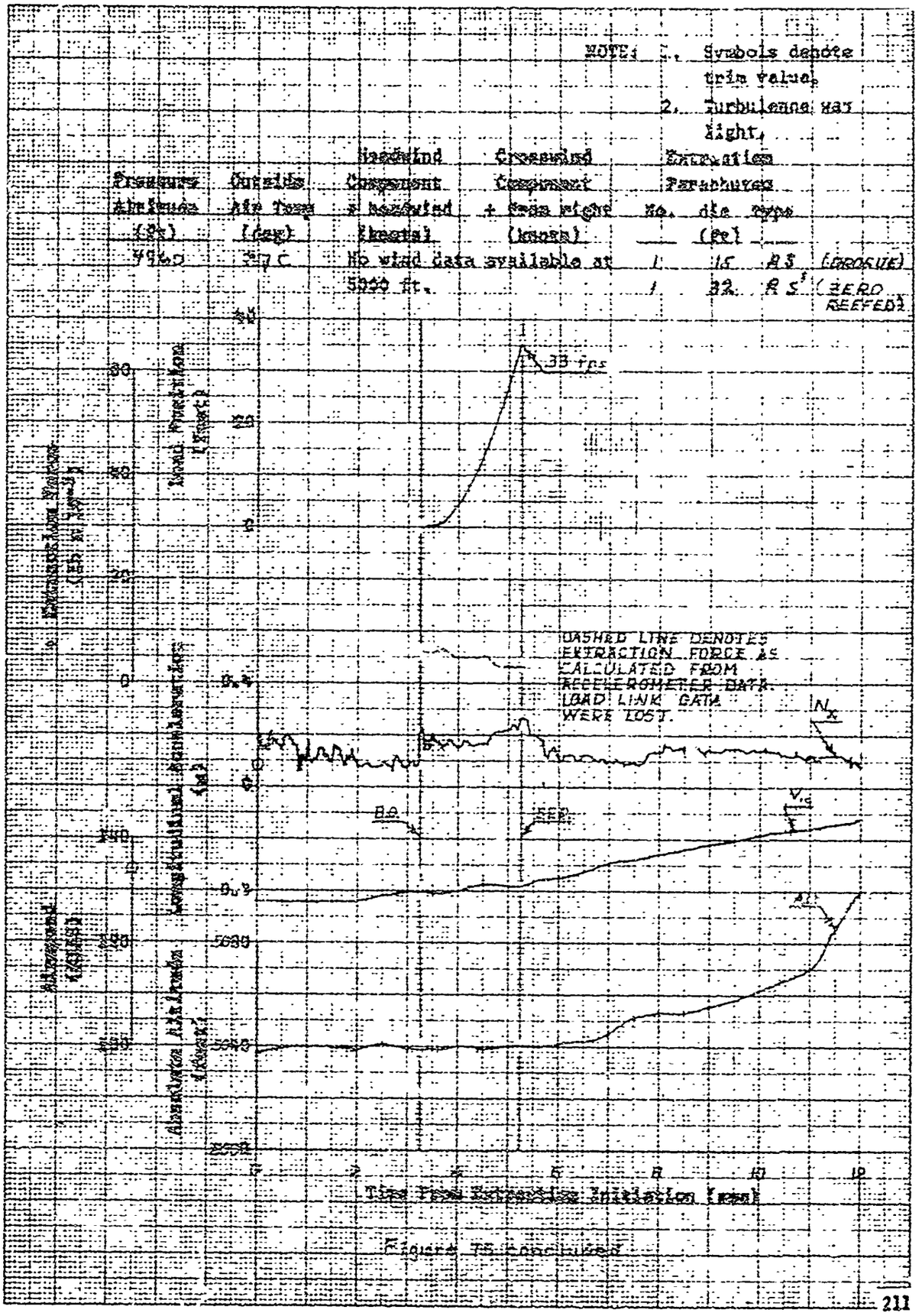


Figure 75 Concluded

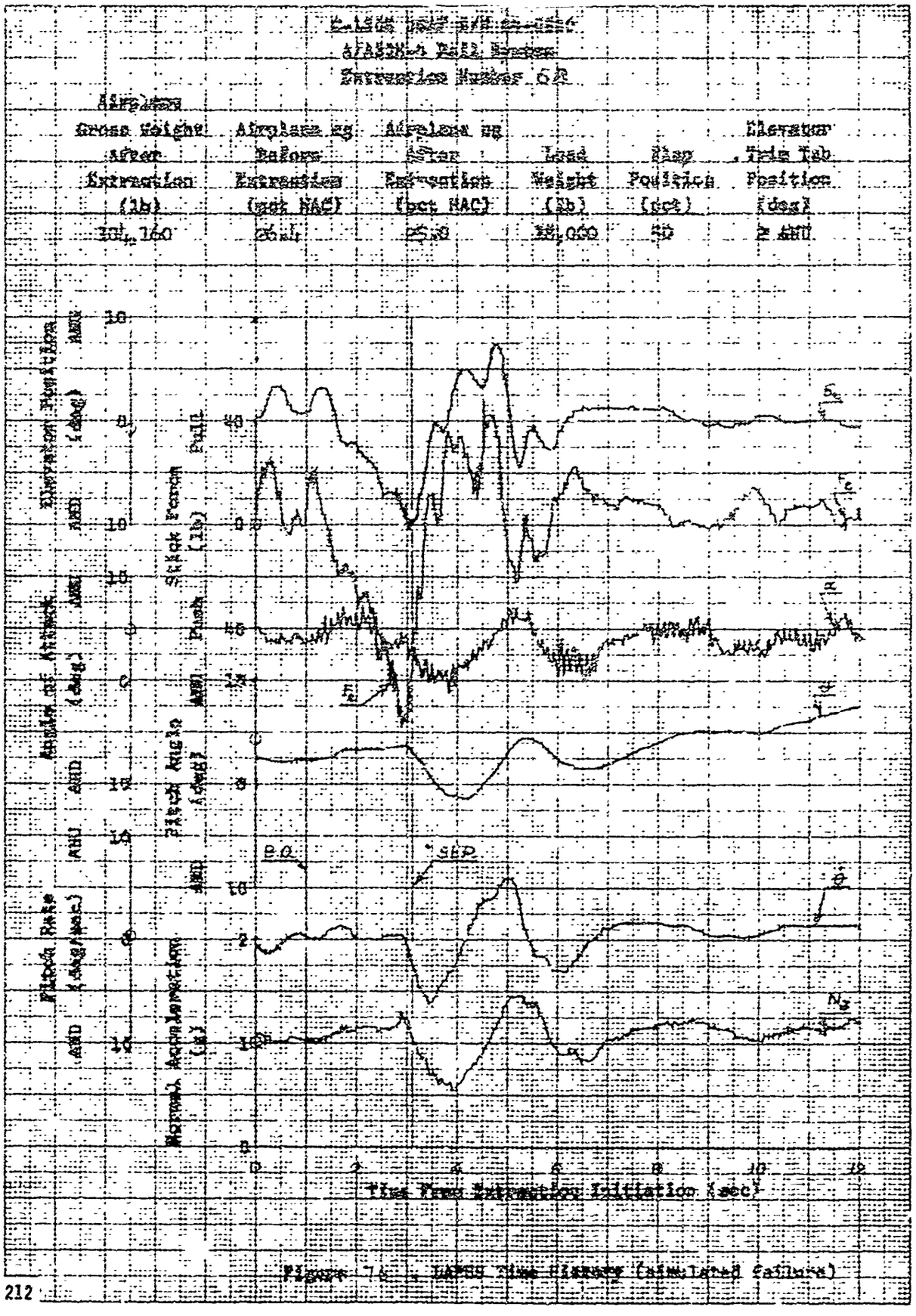


Figure 74. DAMSS Time History (simulated failure)

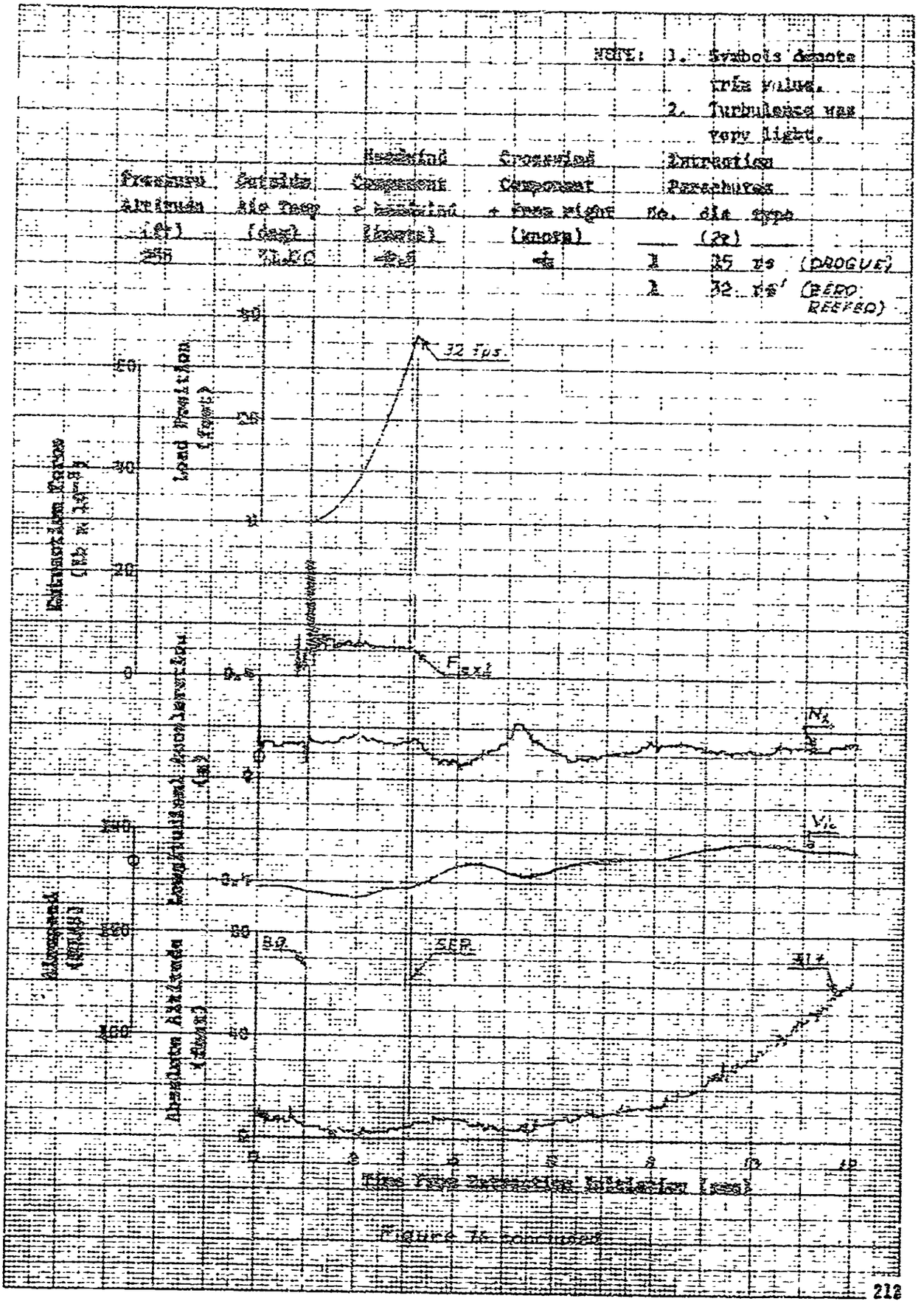


Figure 7. Continued

C-130E [illegible] S/N 64-0550
AFA32[illegible] Data System
Extraction Number 69

Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (pct MAC)	Airplane cg After Extraction (pct MAC)	Load Weight (lb)	Flap Position (pct)	Elevator Trim Tab Position (deg)
[illegible]	25.5	24.7	[illegible]	70	4 AU

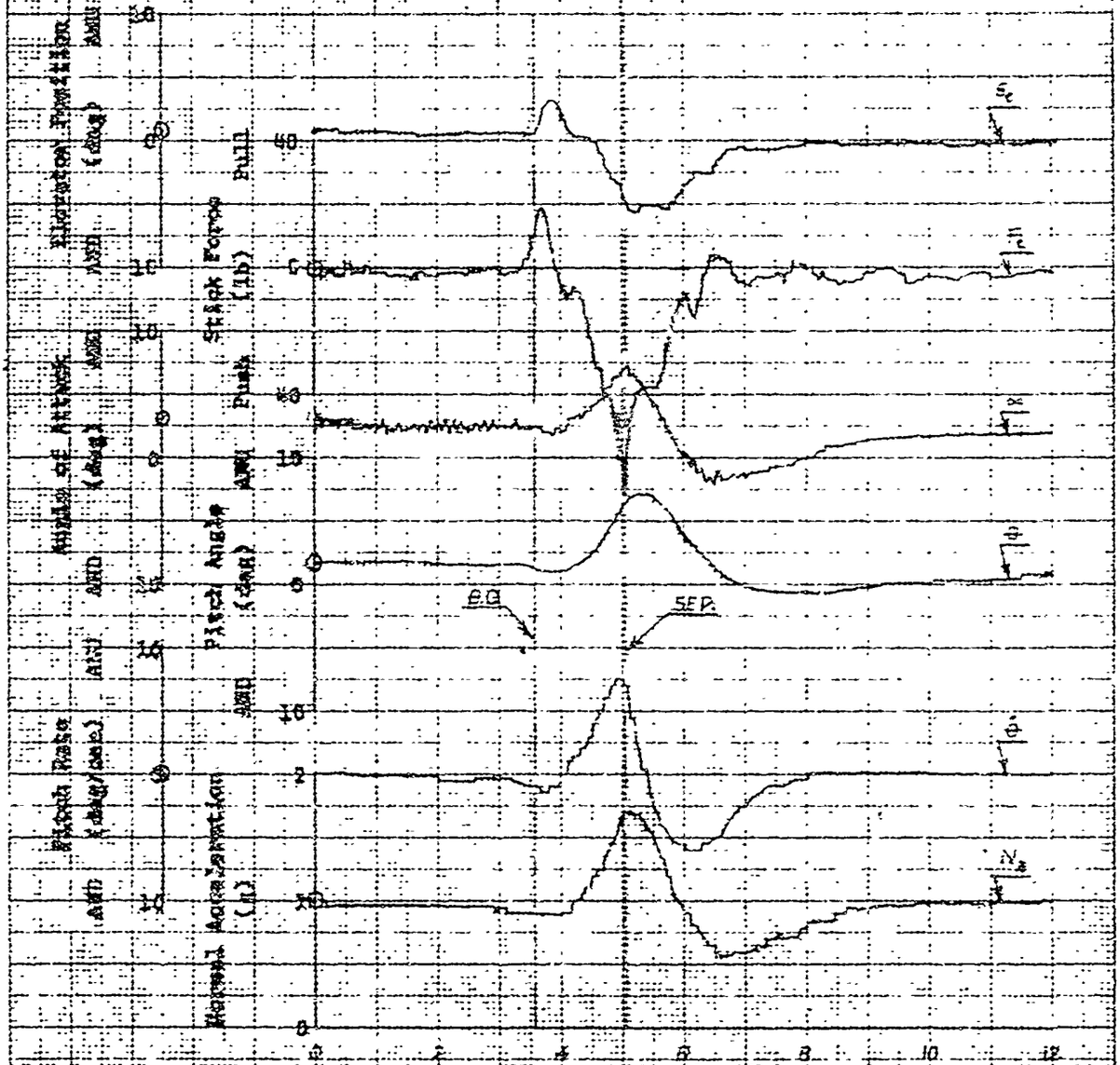


Figure 77. Laboratory Flow History (Simulated Failure)

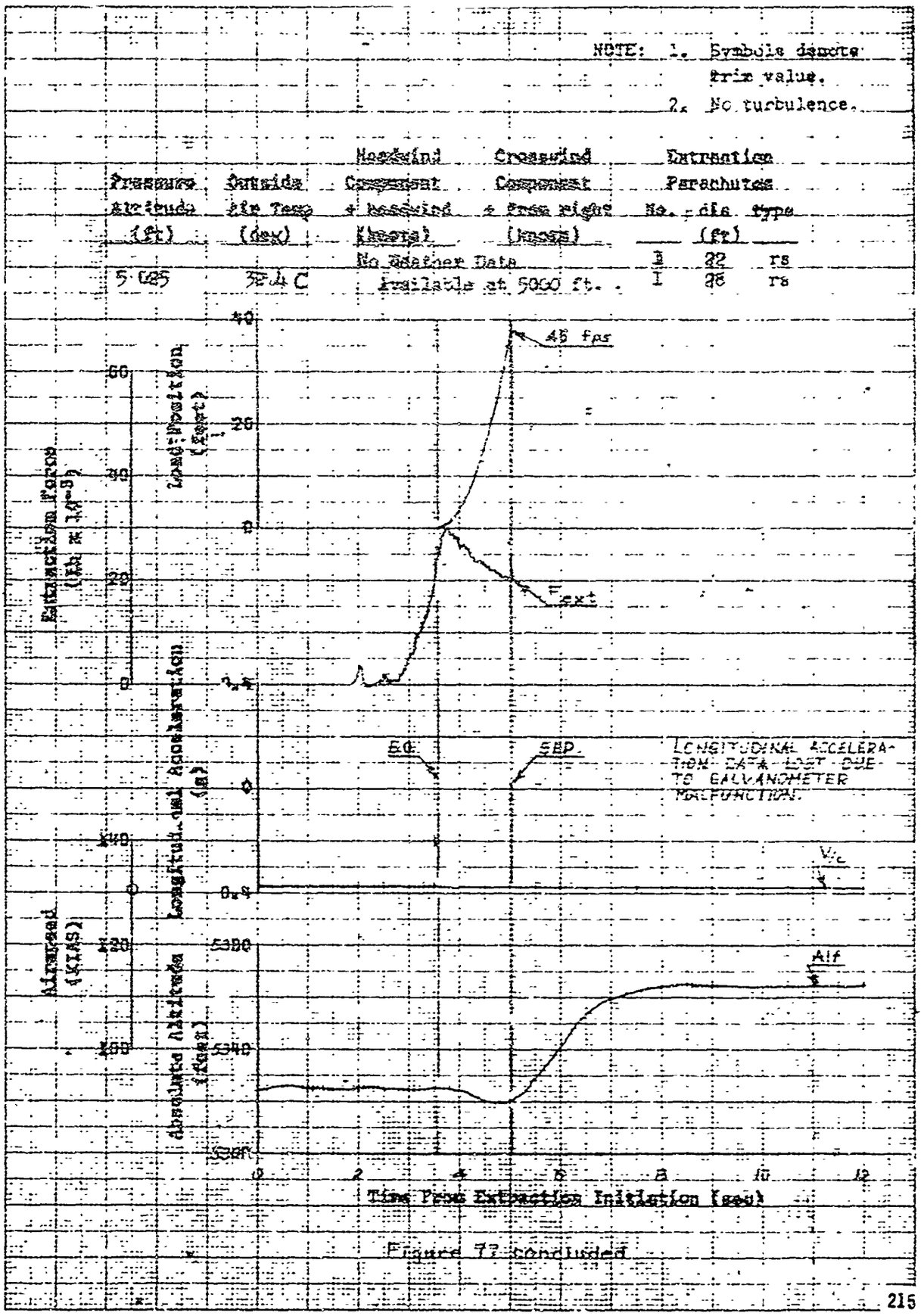


Figure 72 Concluded

C-135B (707 S/N 61-0260
A/SSZH-2 Path System
Extension Number 70

Airplane Gross Weight After Extension (lb)	Airplane cg Before Extension (pct MAC)	Airplane cg After Extension (pct MAC)	Load Weight (lb)	Flap Position (pct)	Elevator Trim Tab Position (deg)
105,650	25.3	25.7	28,960	70	5 AUP

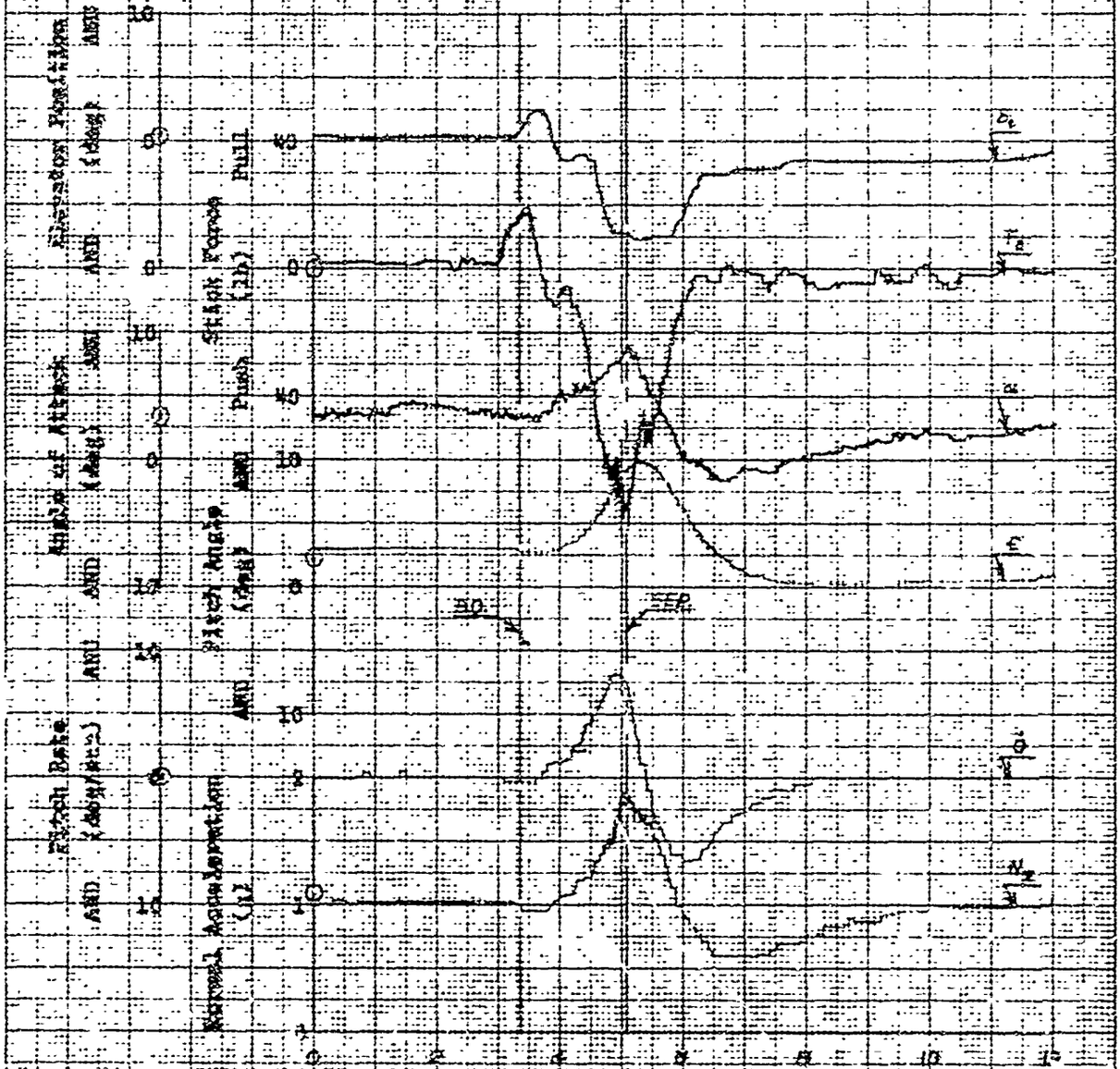


Figure 78. Extension Time History (Simulated Failure)

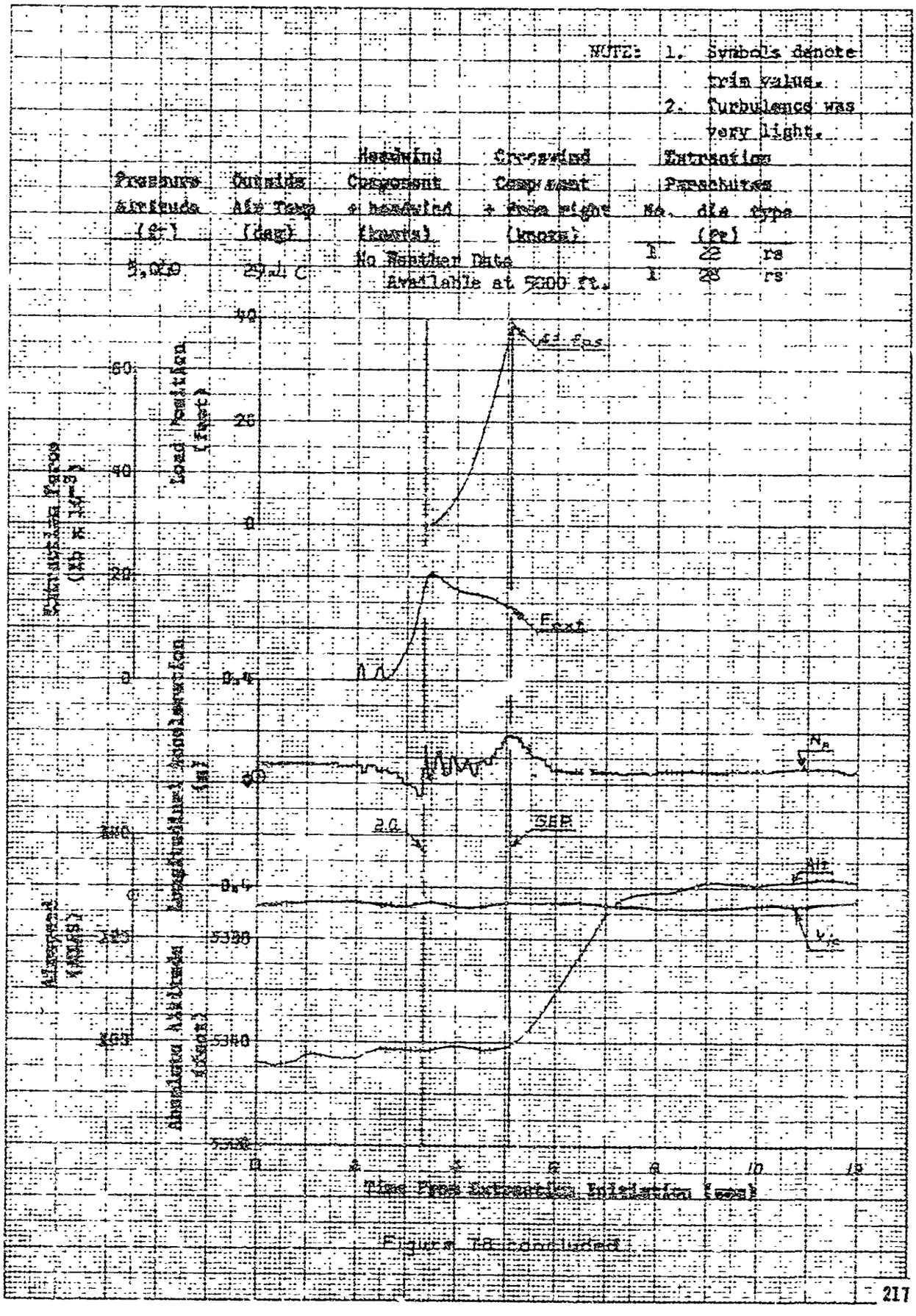


Figure 7a continued

C-[illegible] test A/C
A/C332H-5 FAIL System
Extraction Number 71

Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (pct MAC)	Airplane cg After Extraction (pct MAC)	Load Weight (lb)	Flap Position (pct)	Elevator Trim Tab Position (deg)
103,700	23.7	25.7	25,000	70	5 ANU

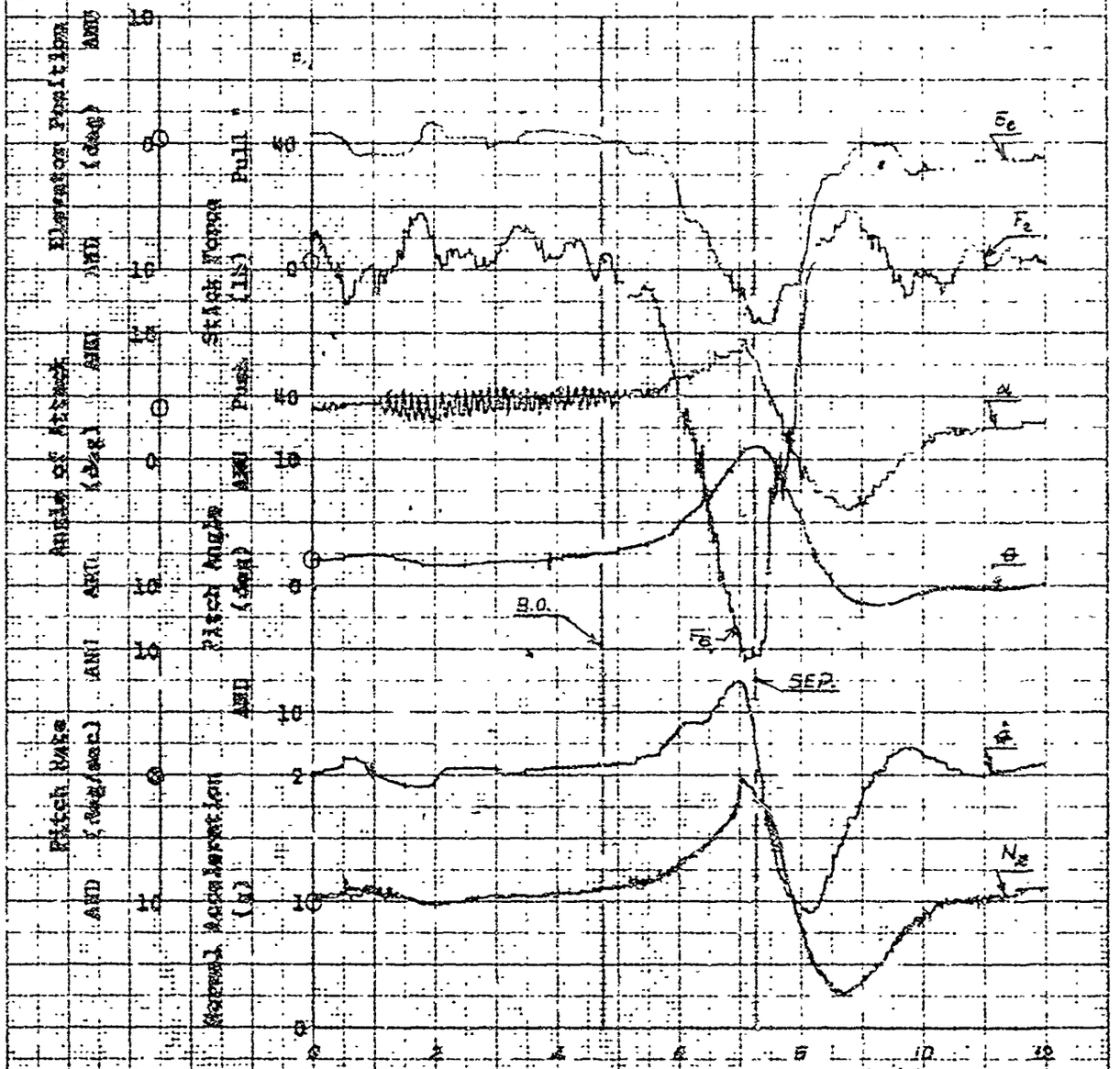


Figure 79. DAPES Time History (simulated failure)

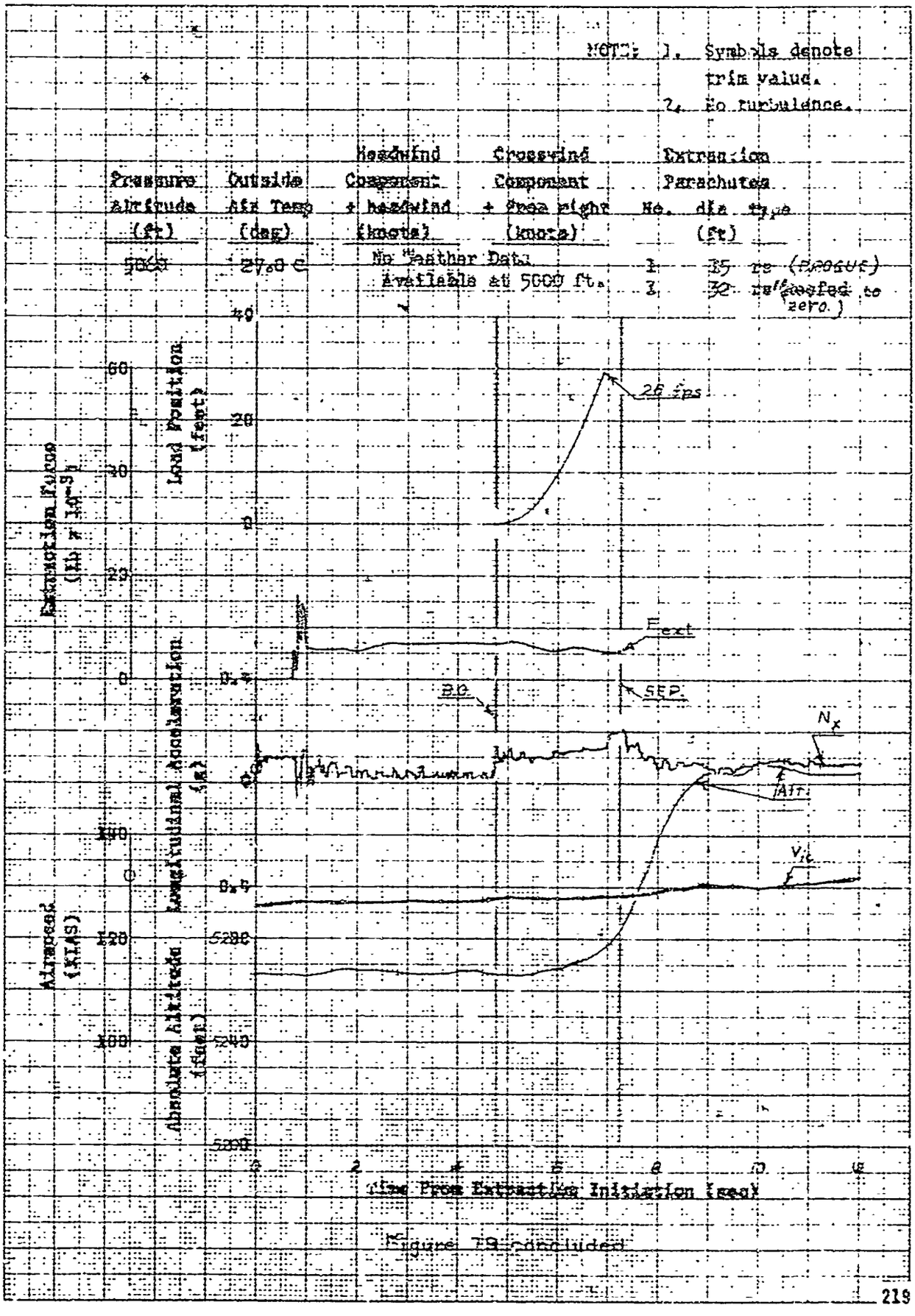


Figure 79 concluded

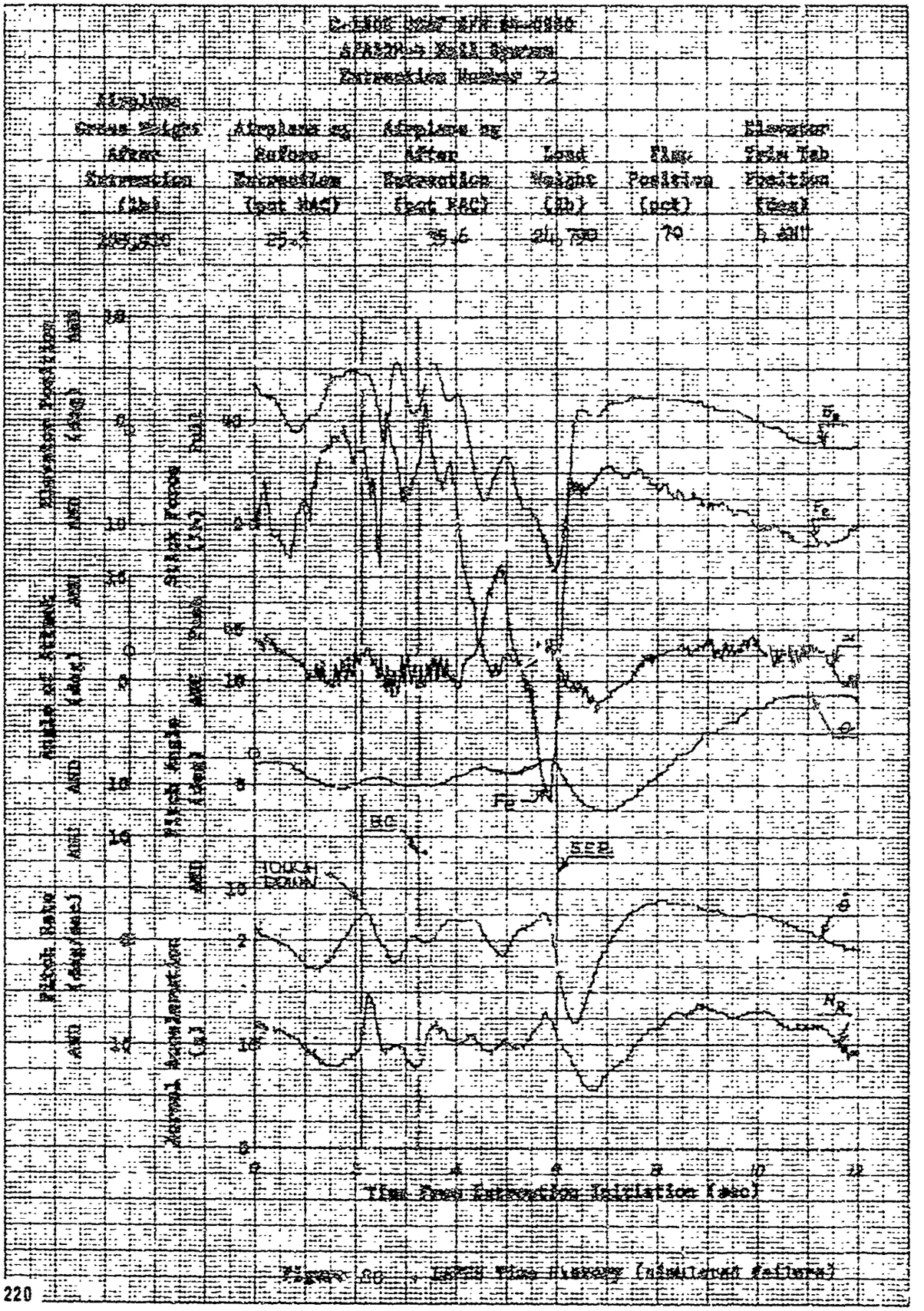


Figure 80. Extra Time History (Simulated Failure)

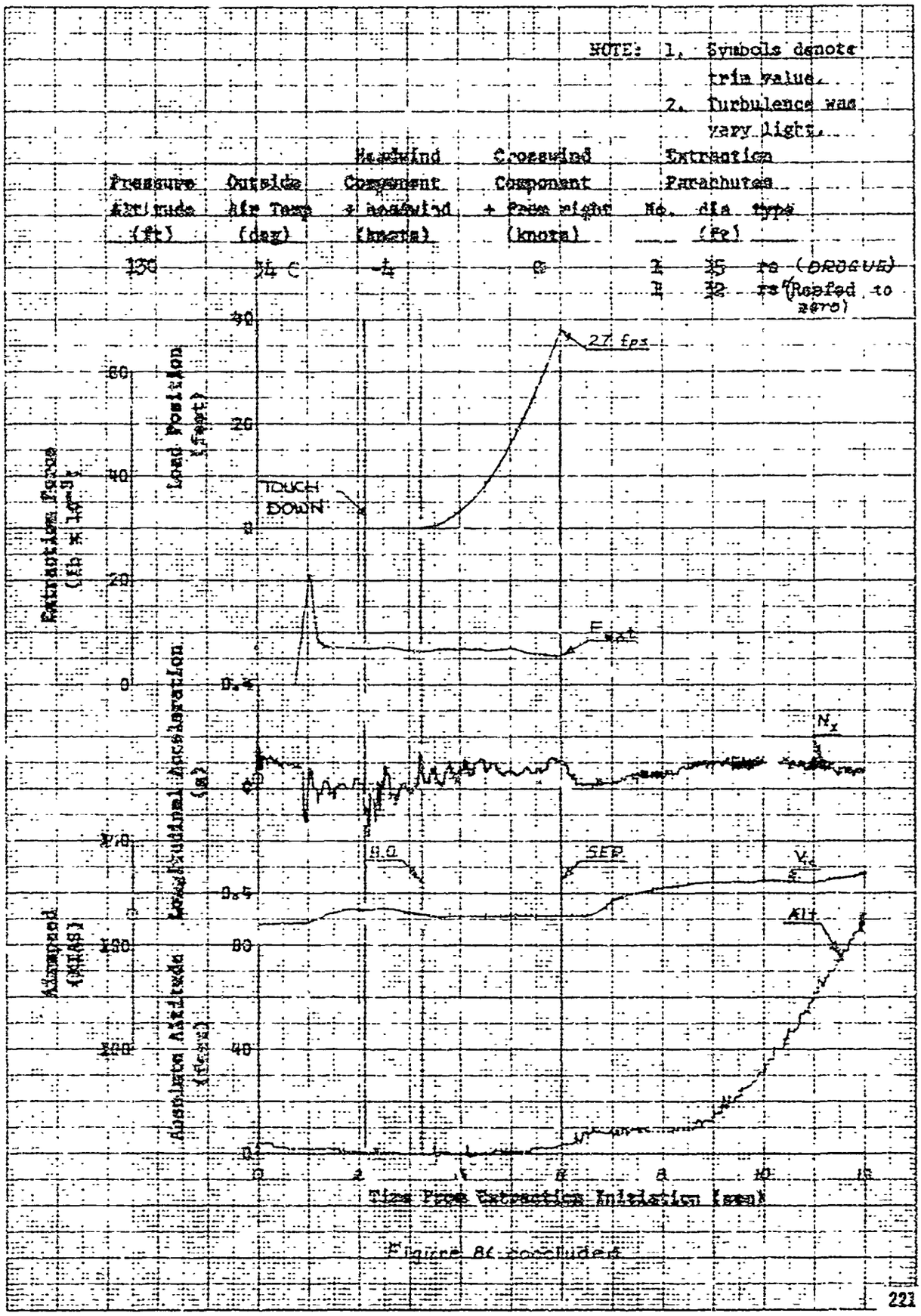


Figure 86 concluded

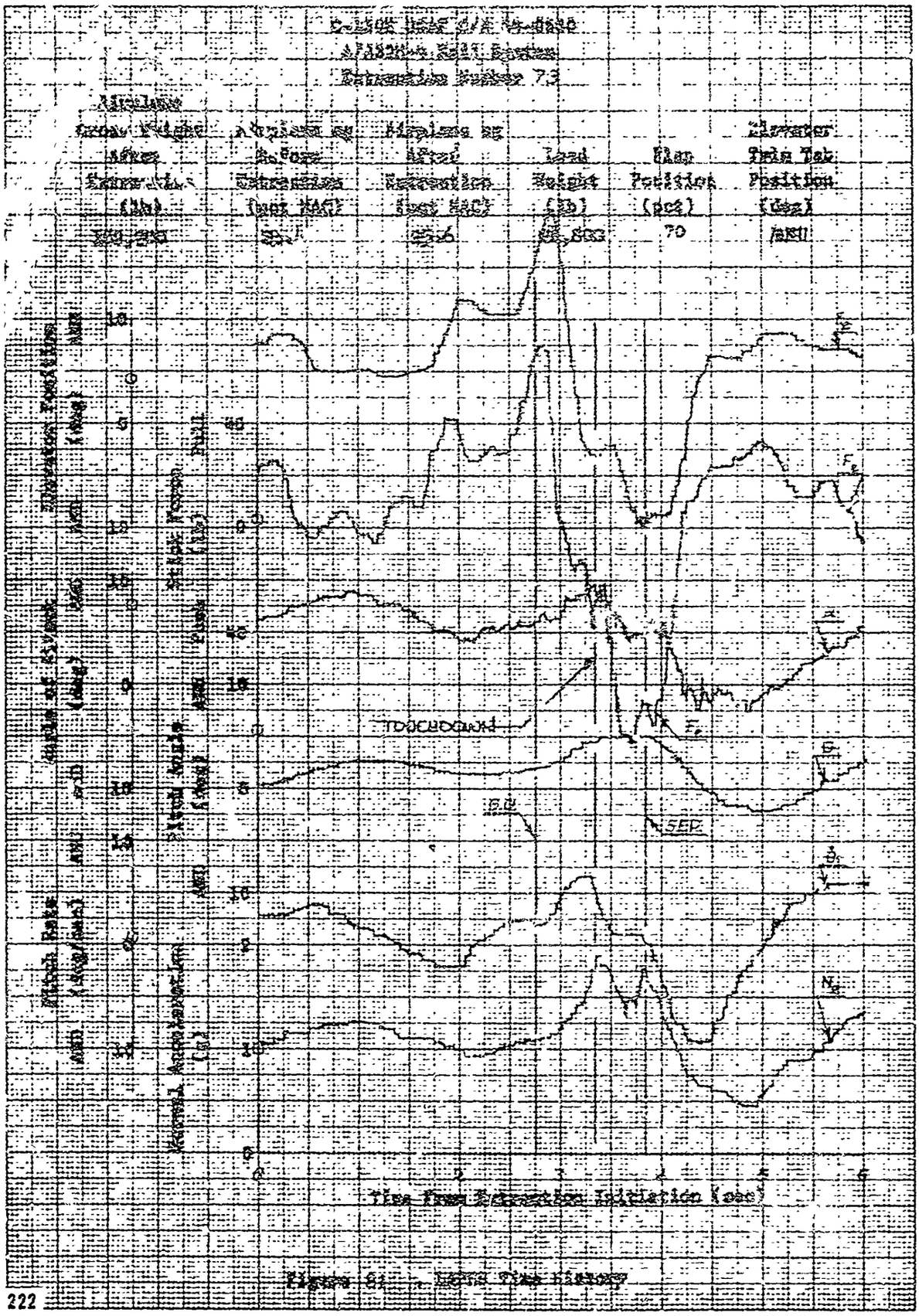


Figure 61. ... Data Time History

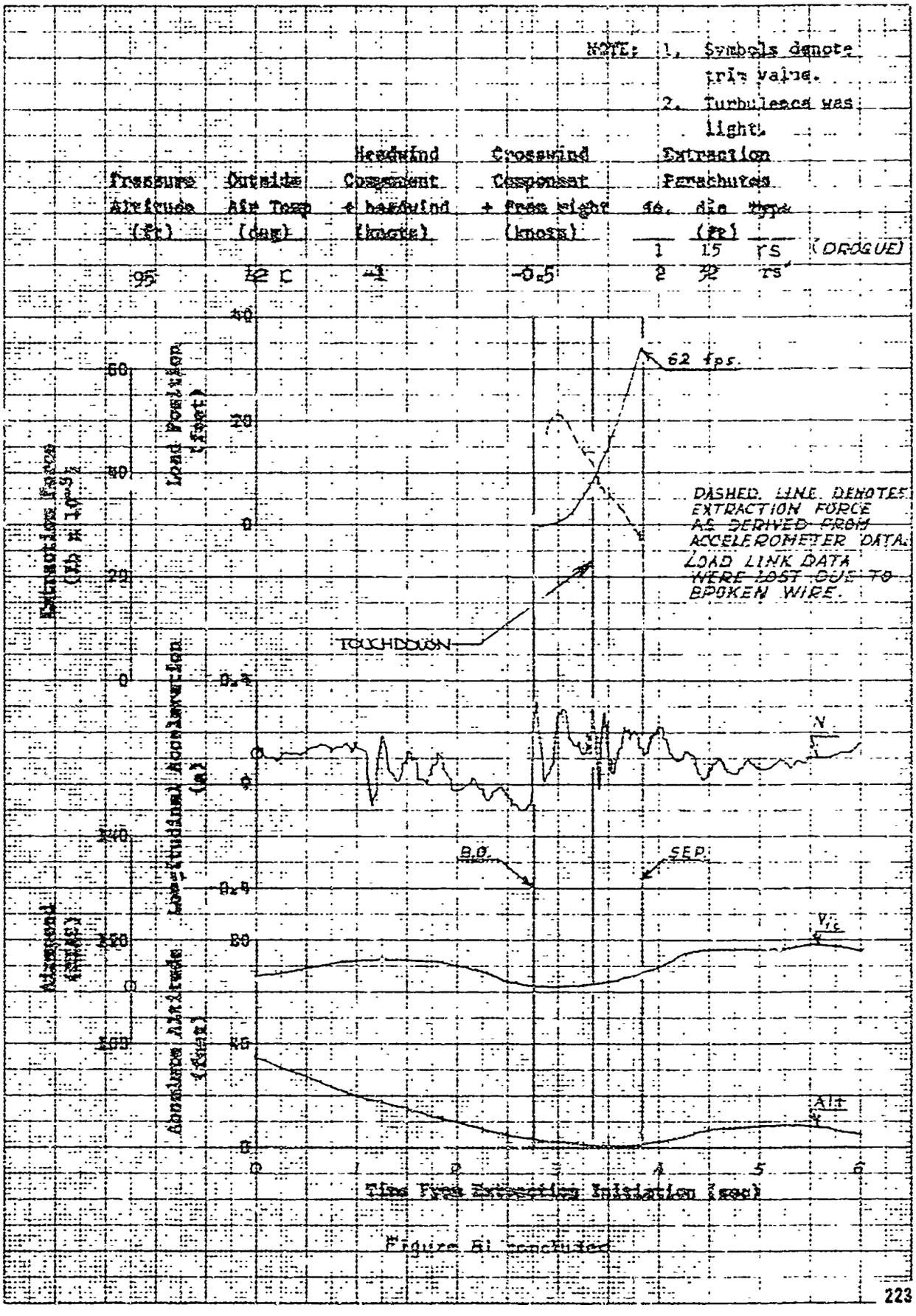


Figure A1 concluded

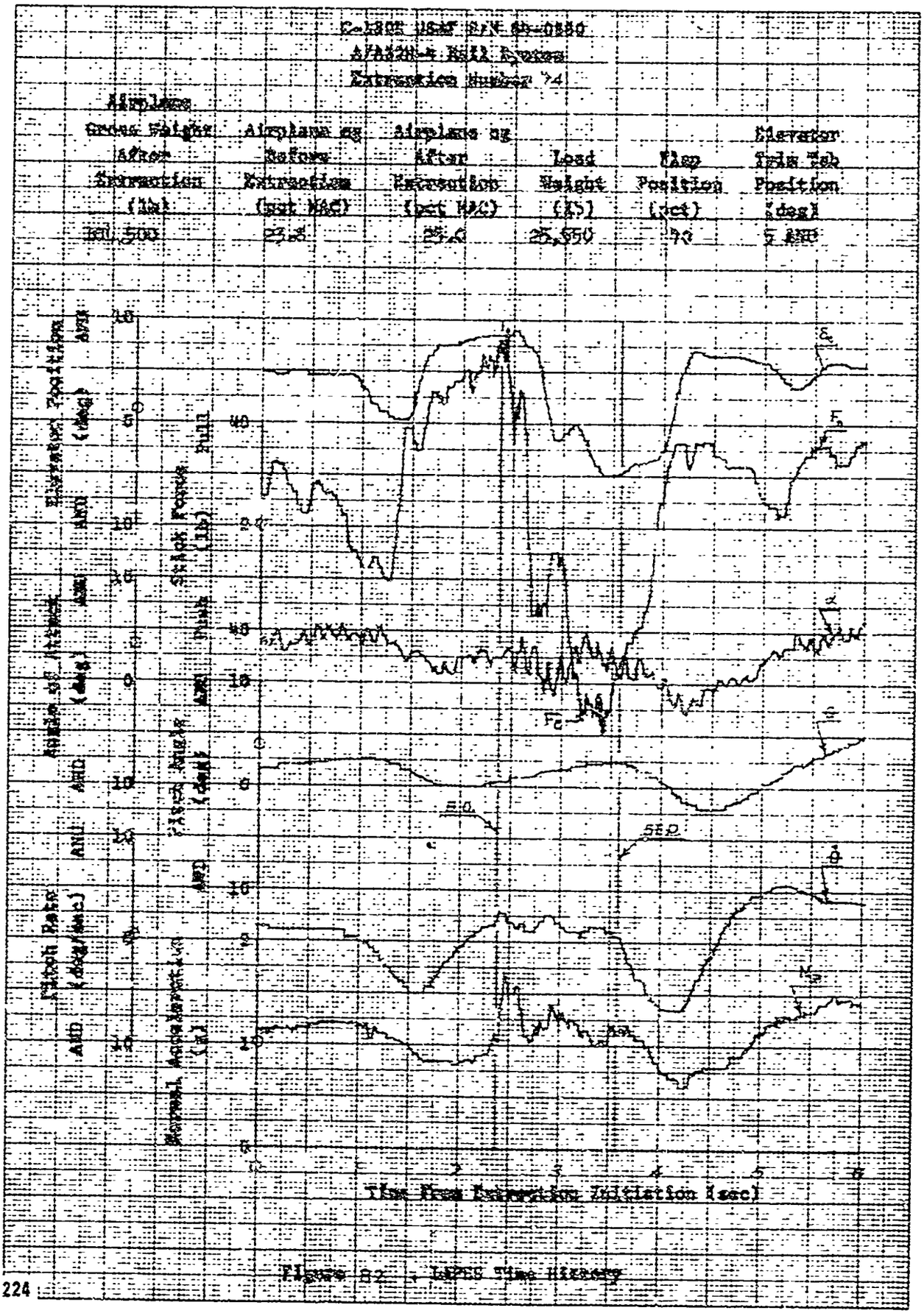


Figure 82. C-130E Time History

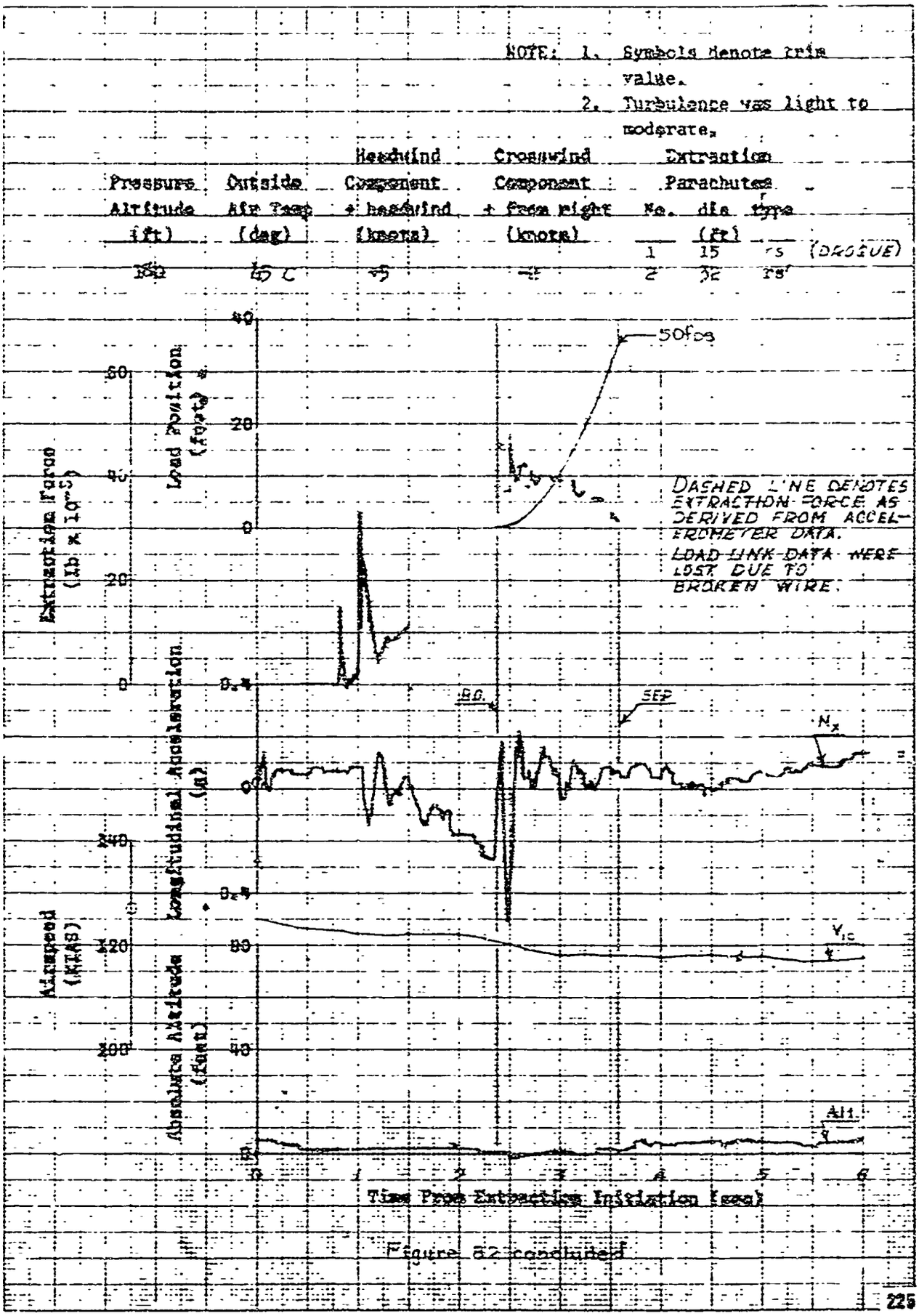


Figure 82 concluded

C-130E (Navy) S/N 69-5880
A/A32H-4 Refil System
Extraction Number 2E

Airplane Gross Weight After Extraction (lb)	Airplane cg Before Extraction (pct MAC)	Airplane cg After Extraction (pct MAC)	Load Weight (lb)	Flap Position (pct)	Elevator Trim Tab Position (deg)
102,600	23.2	23.8	18,700	50	4 AHU

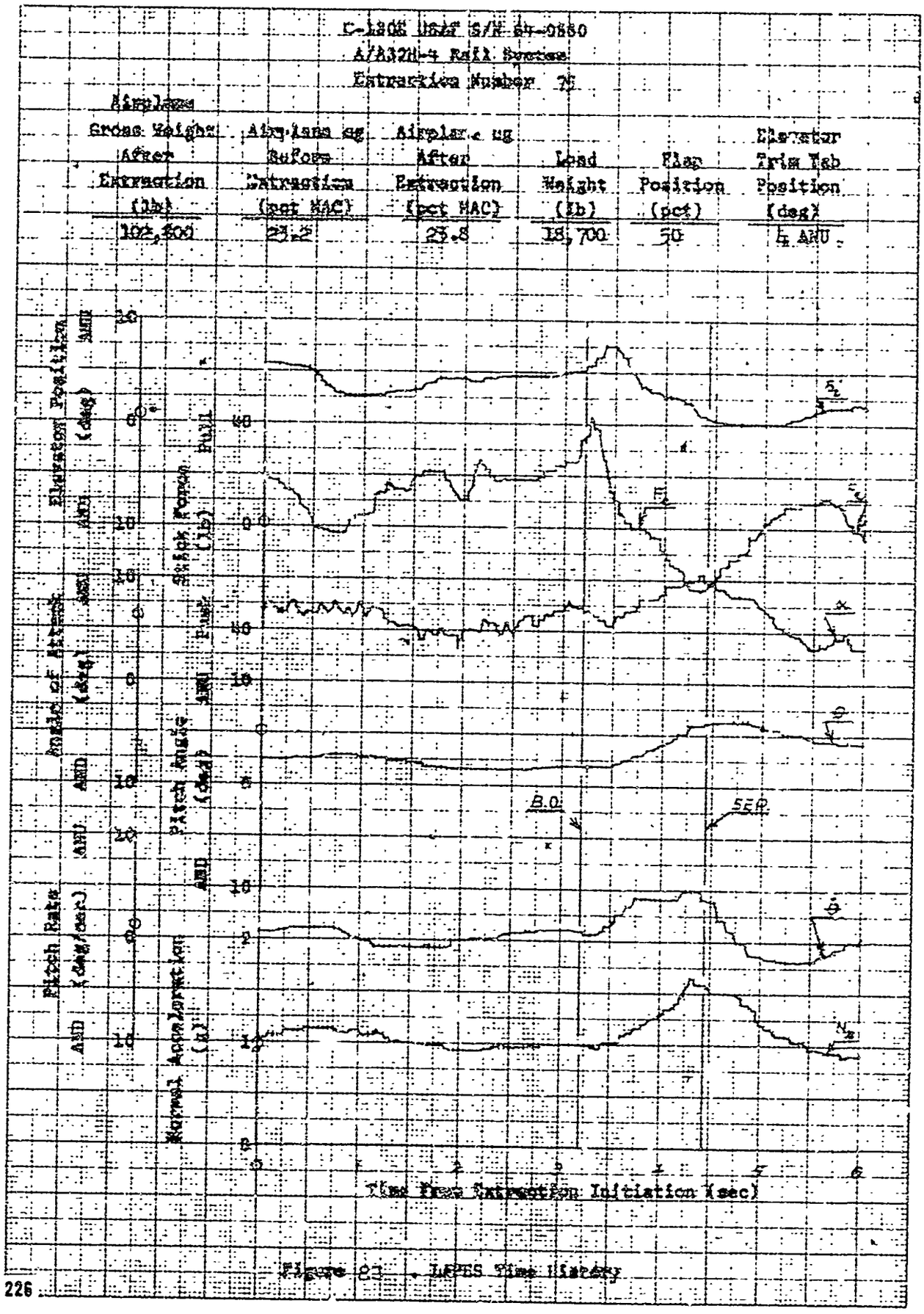


Figure 83. - LAPES Time History

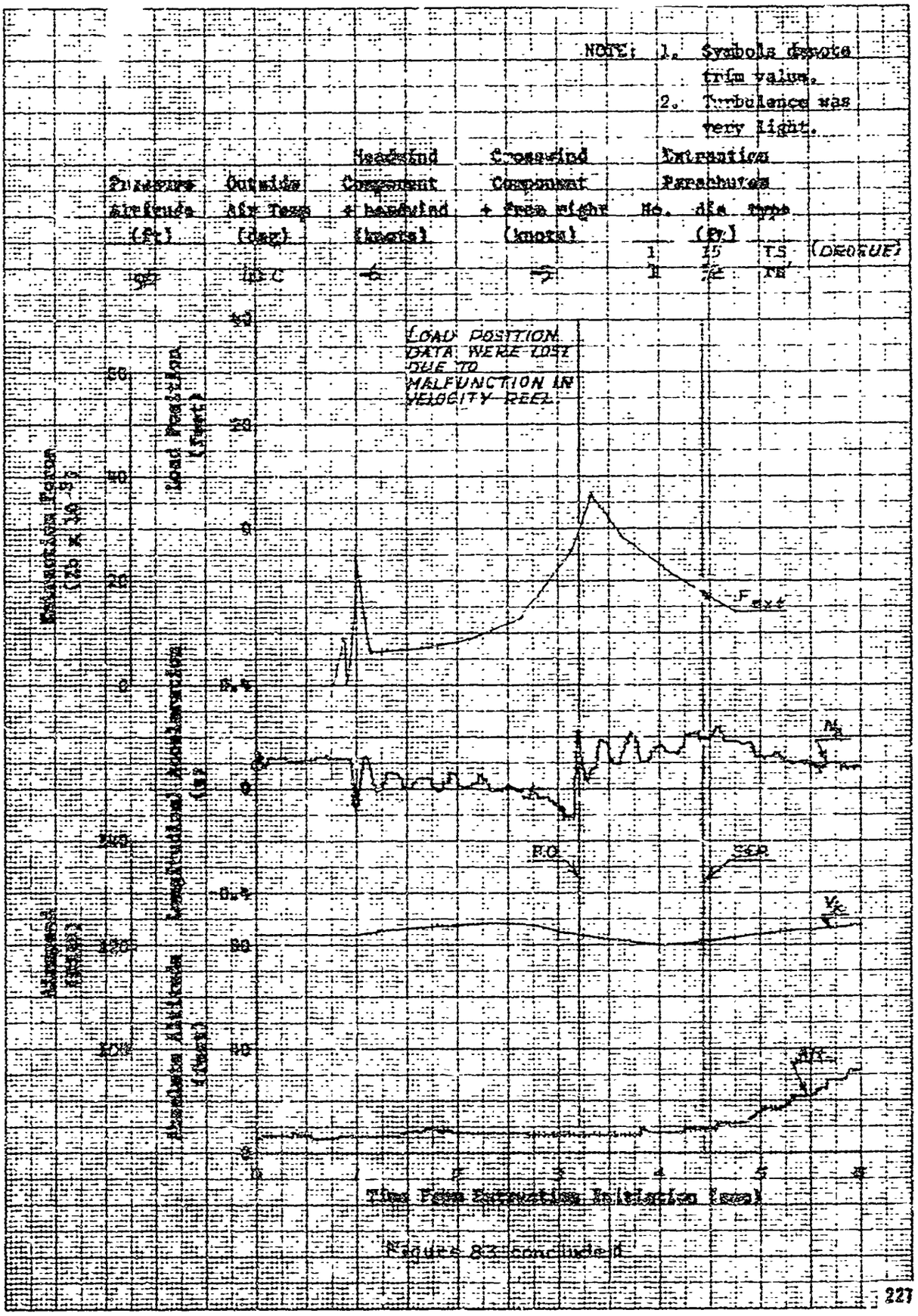
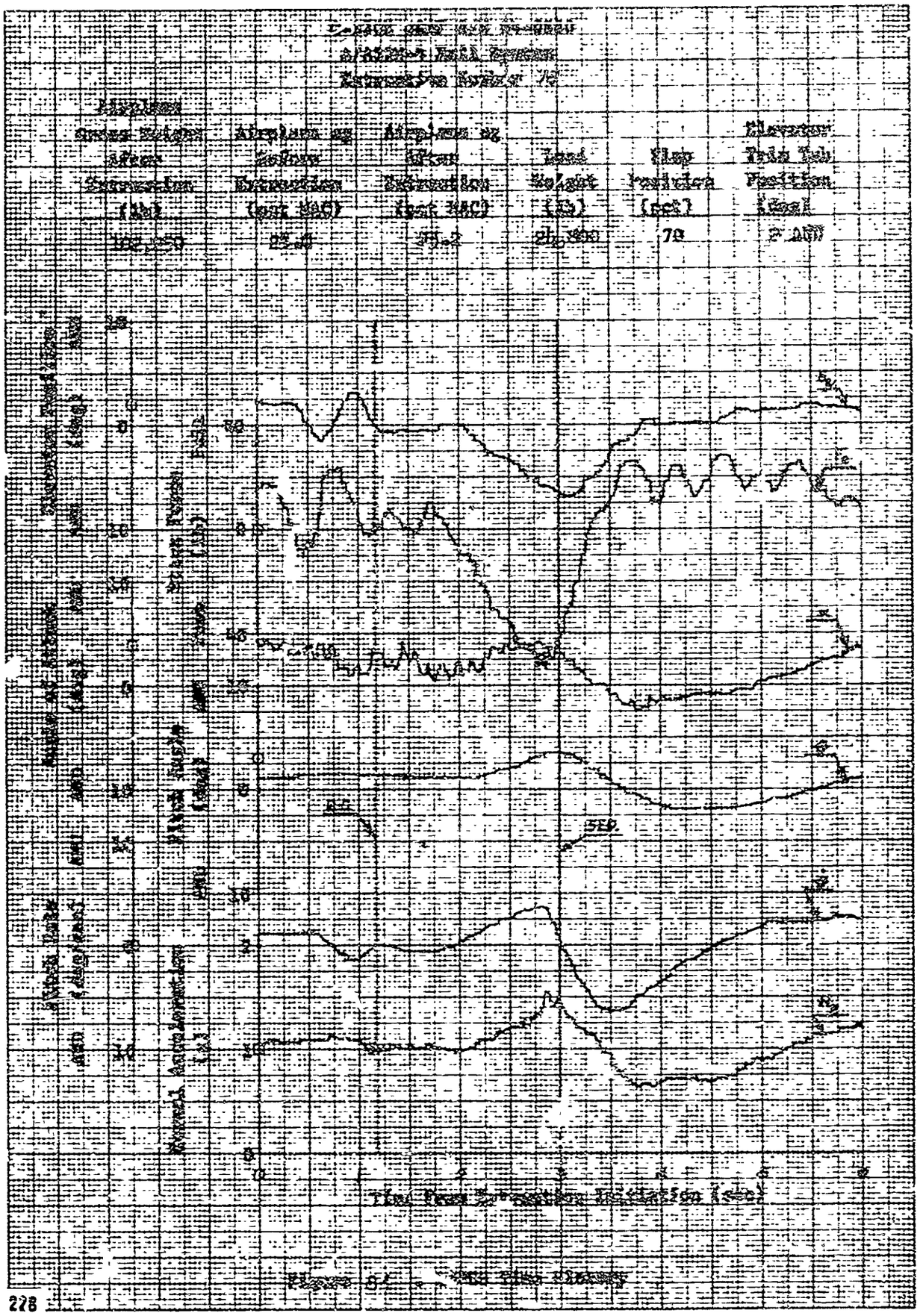


Figure 83 Concluded



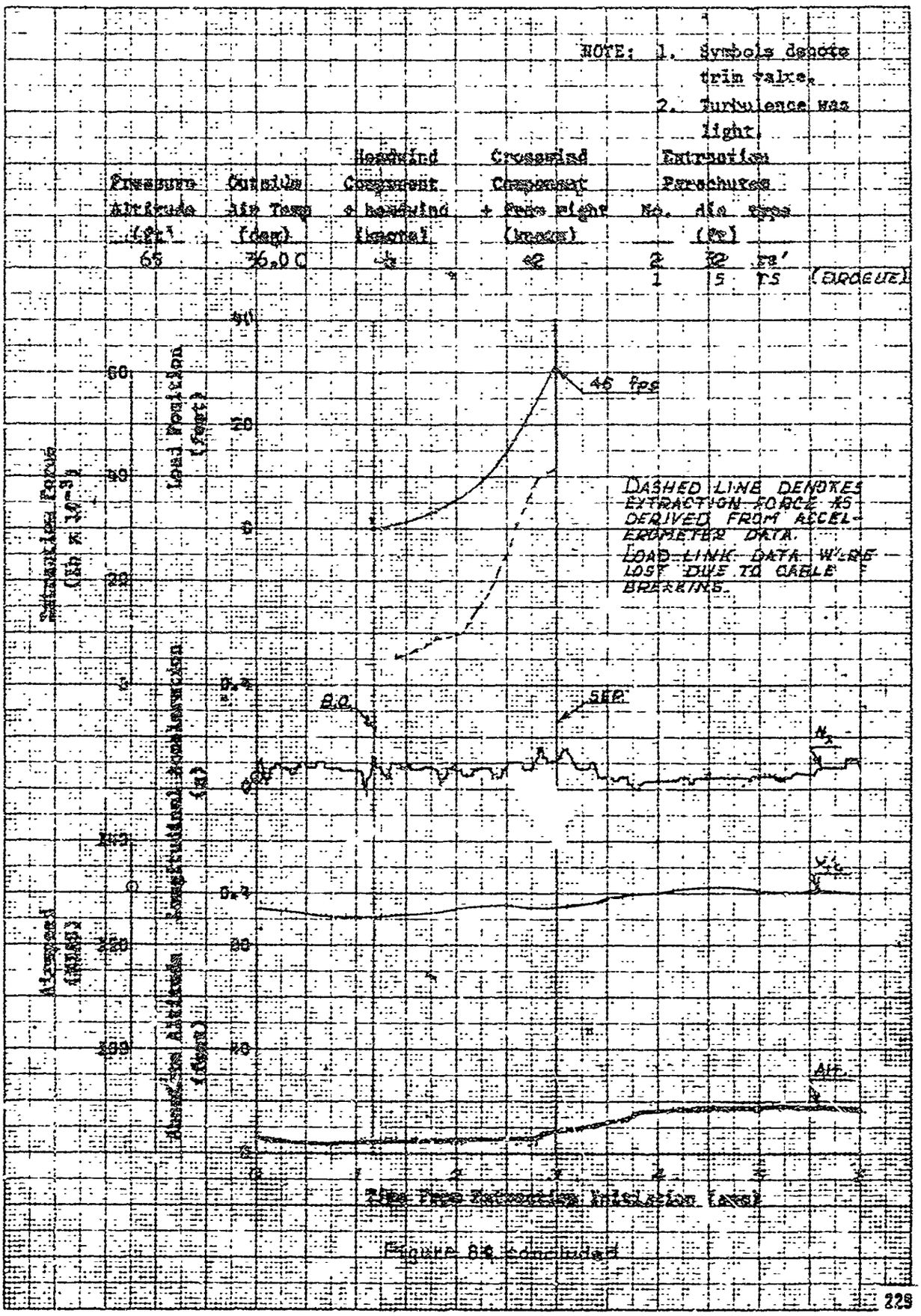
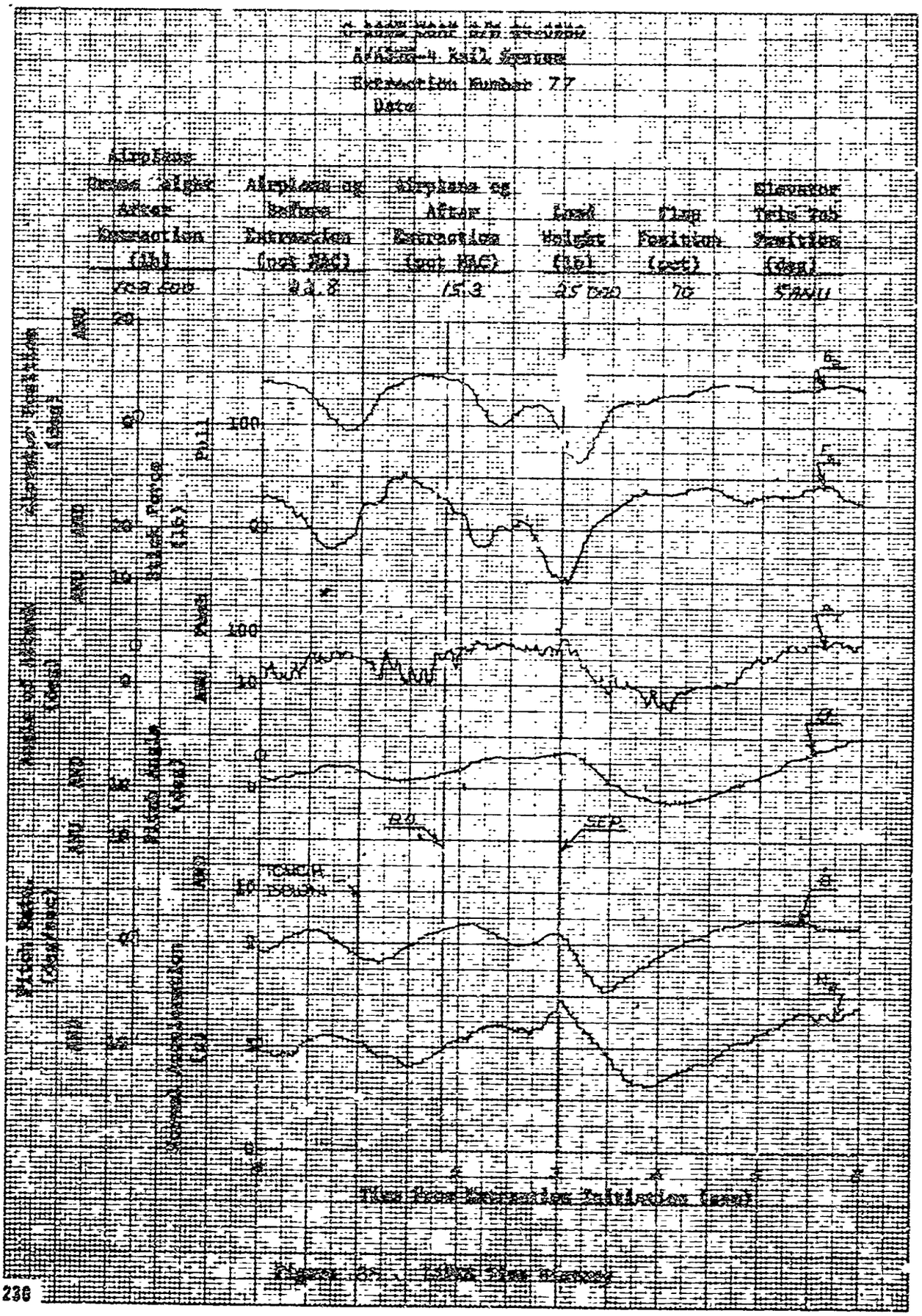


Figure 84 Concluded


Airplane
Gross Weight
After
Maneuver
(lb)
Airplane cg
Before
Maneuver
(per MAC)
Airplane cg
After
Maneuver
(per MAC)
Load
Factor
(g)
Flap
Position
(pct)
Elevator
Trim Tab
Position
(deg)
Maneuver Pull-up
Maneuver Pull-down
Time from Maneuver Initiation (sec)

NOTE: 1. Symbols denote trim value.
2. Turbulence was light.

Pressure Altitude (ft)	Outside Air Temp (deg)	Headwind Component + headwind (knots)	Crosswind Component + from right (knots)	Extraction Parachutes No.	dia (ft)	type
85	41.5 C	-3	-2	2	32	85'
				1	15	85 (DROGUE)

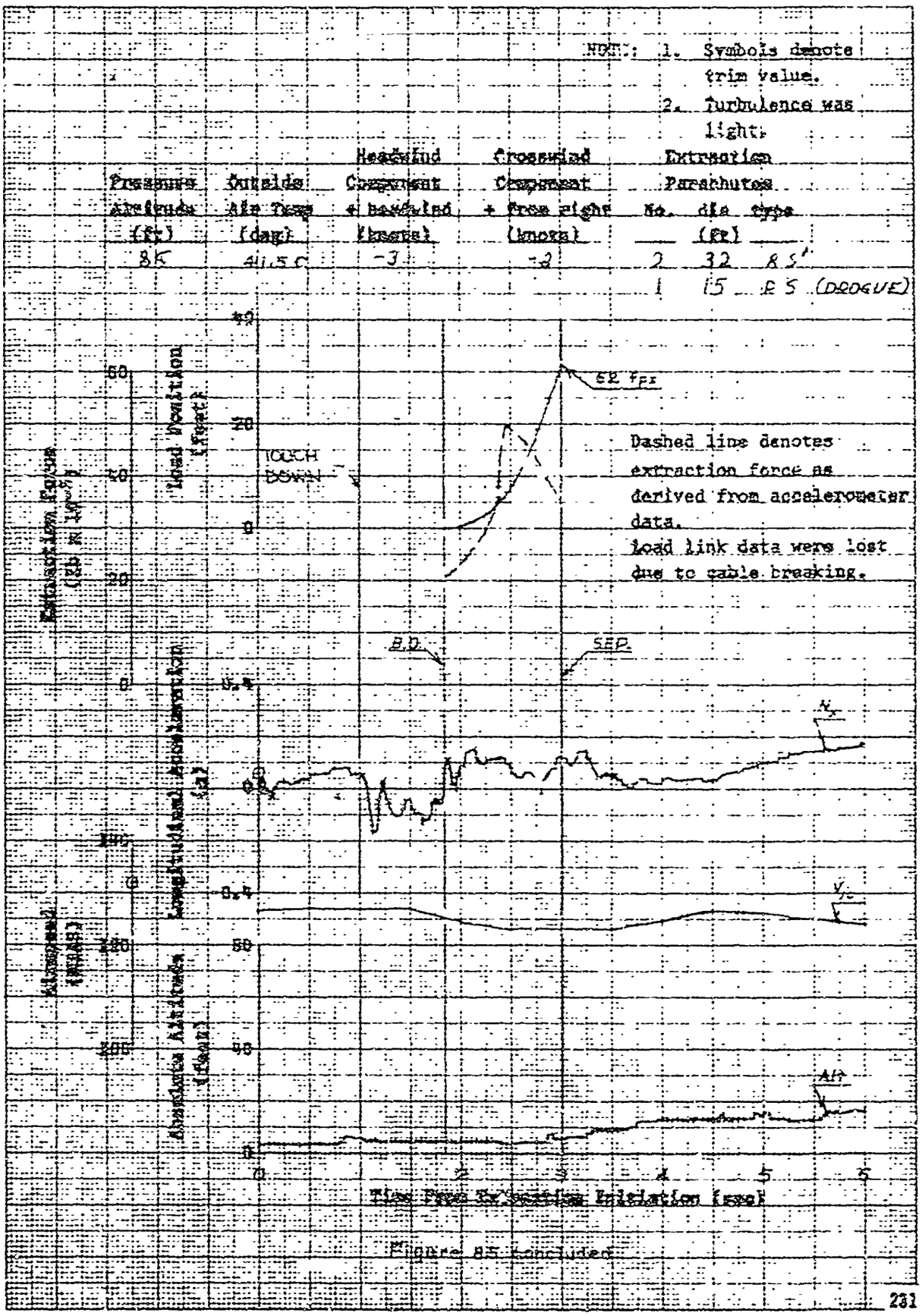


Figure 85 Concluded

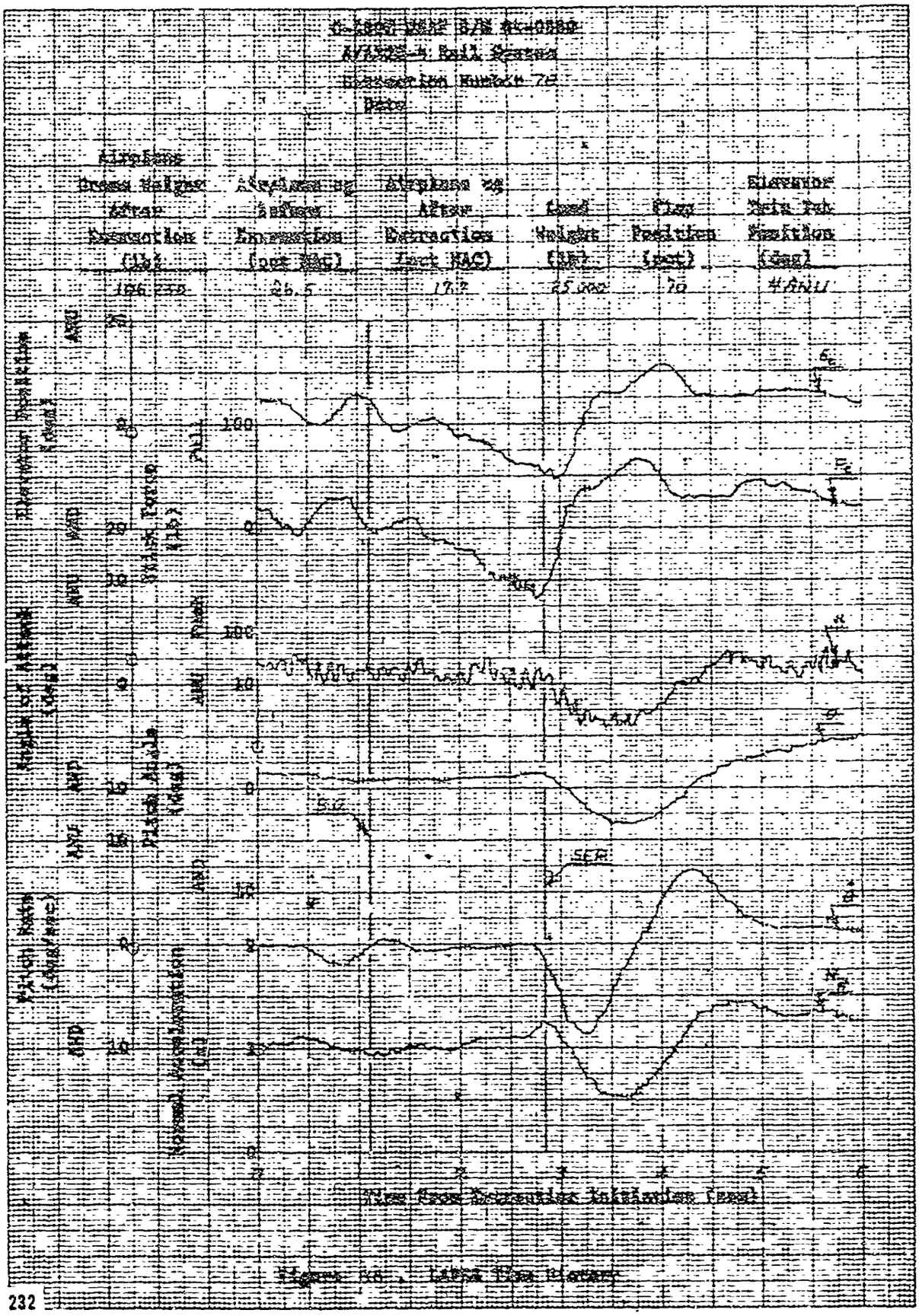


Figure 20. Large Jet Bomber

NOTE: 1. Symbols denote trim value.
2. Turbulence was light.

Pressure Altitude (ft)	Outside Air Temp (deg)	Reading Component + headwind (knots)	Crosswind Component + from right (knots)	No.	Extraction Parachutes dia type (ft)	
65	36.5	-2	-4	2	32	RS'
				1	15	RS (DROGUE)

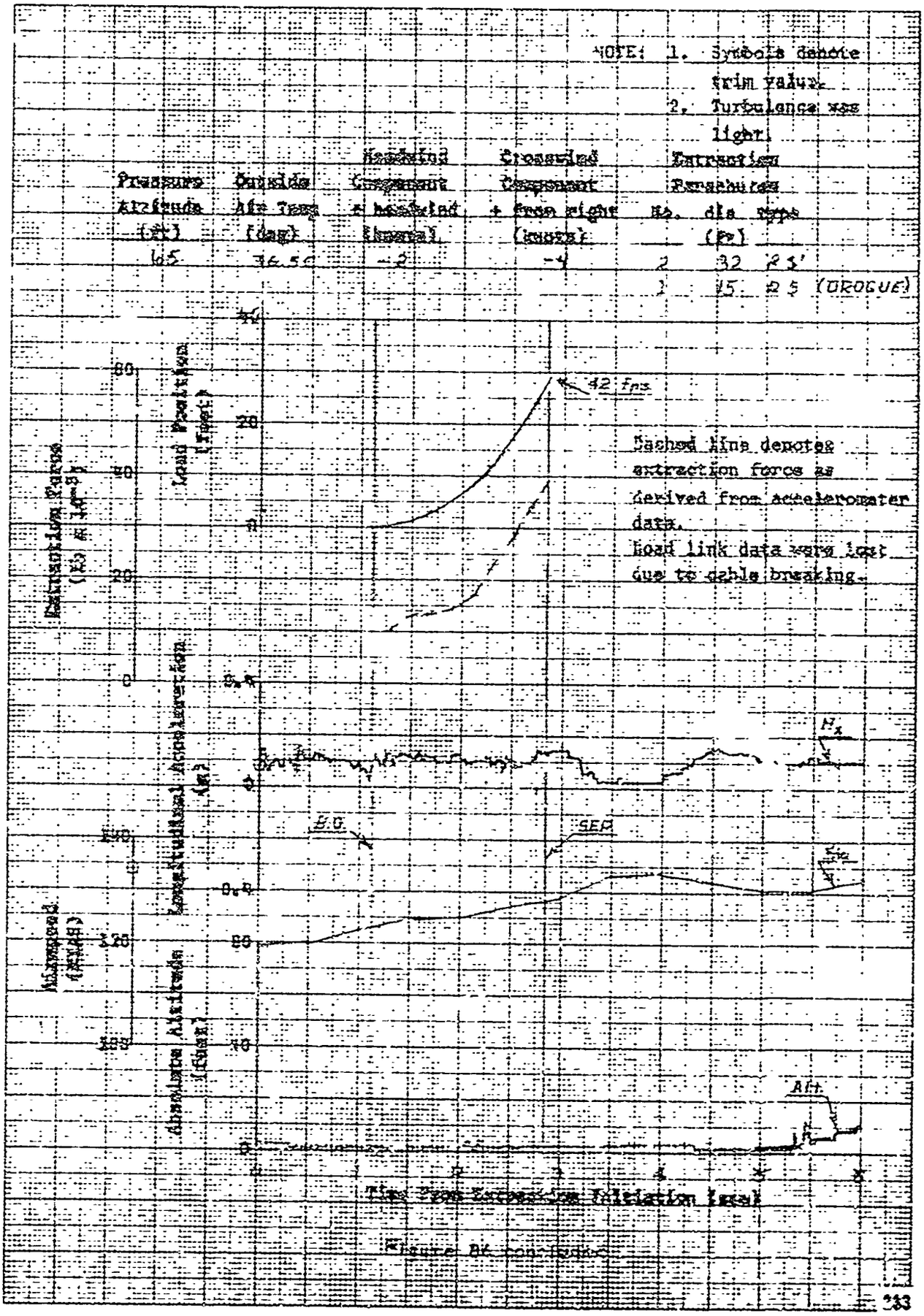


Figure 8C con't

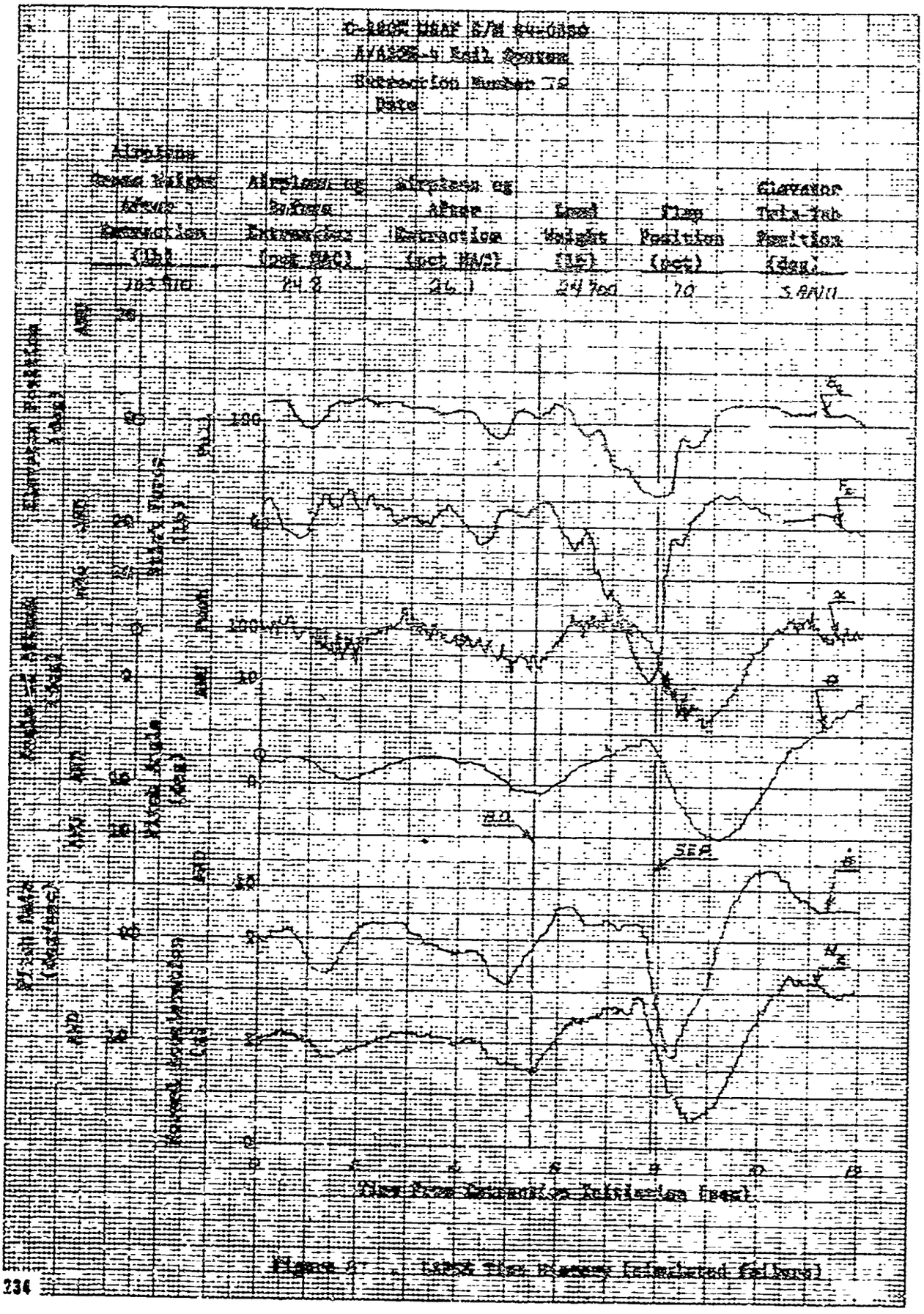
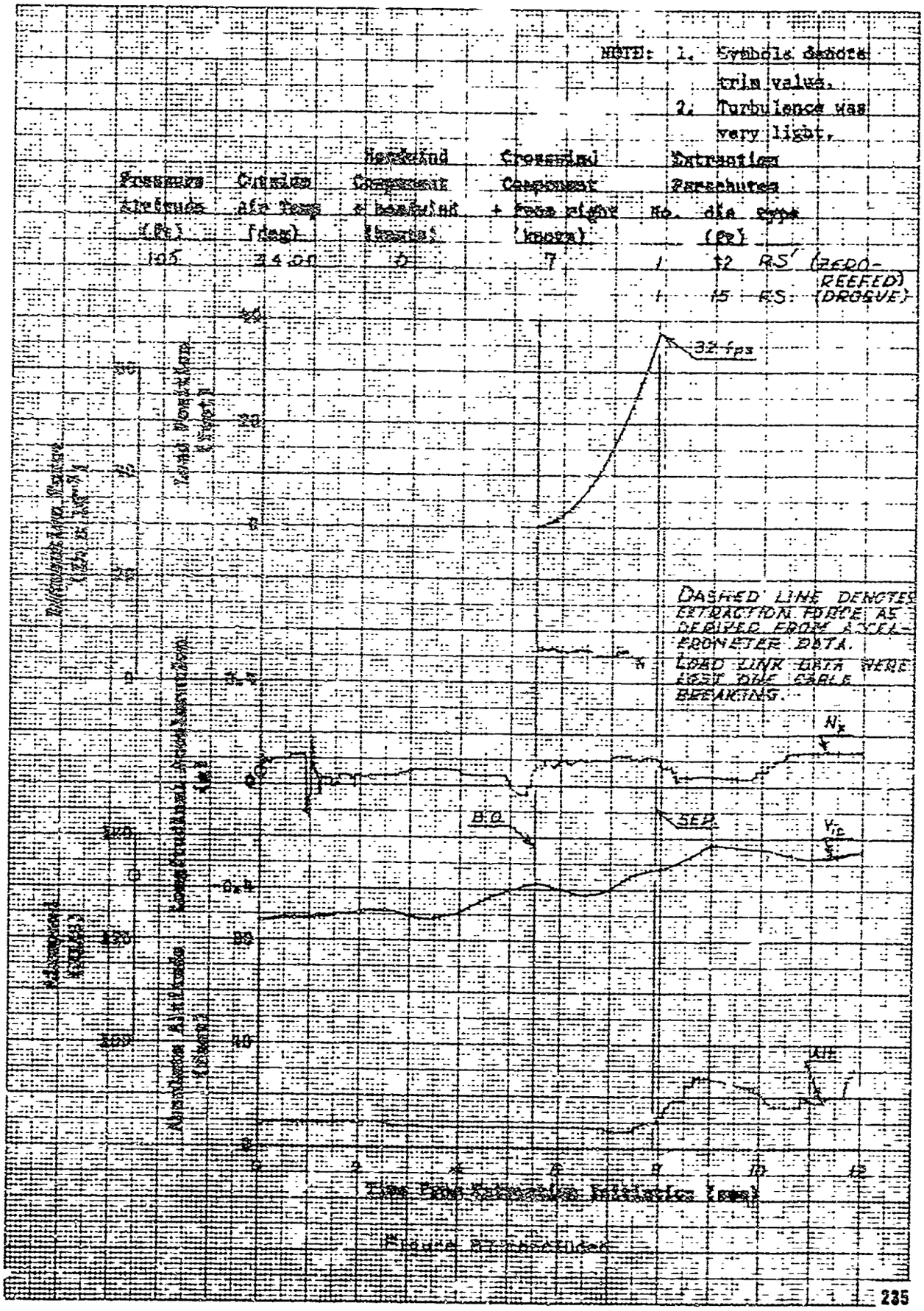


Figure 6. ... Lateral Flow Planarity Calculated (Delta)


NOTE: 1. Symbols denote trim values.
2. Turbulence was very light.
Pressure Altitude (ft)
Outside Air Temp (deg)
Headwind Component + headwind (knots)
Crosswind Component + from right (knots)
Extraction Parachutes No. dia type (ft)
1 12 RS (ZERO-REEFED)
1 15 RS (DROGUE)
32 fps
DASHED LINE DENOTES EXTRACTION FORCE AS DERIVED FROM ACCELEROMETER DATA. LOAD LINK DATA WERE LOST DUE CABLE BREAKING.
B.O.
SEP.
Time from Extraction Initiation (sec)
Figure 87 Concluded

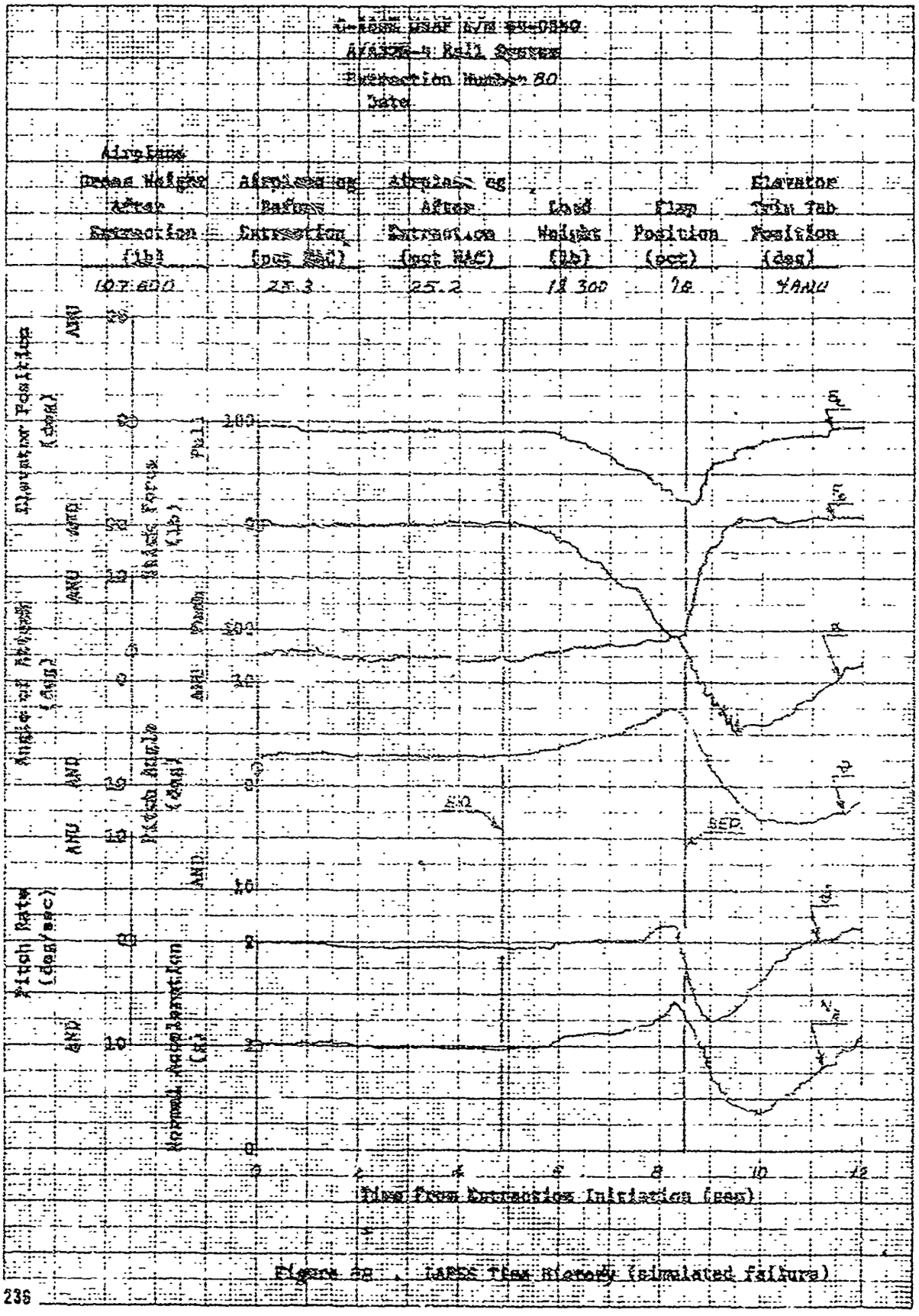


Figure 22 . JAFSS Time History (simulated failure)

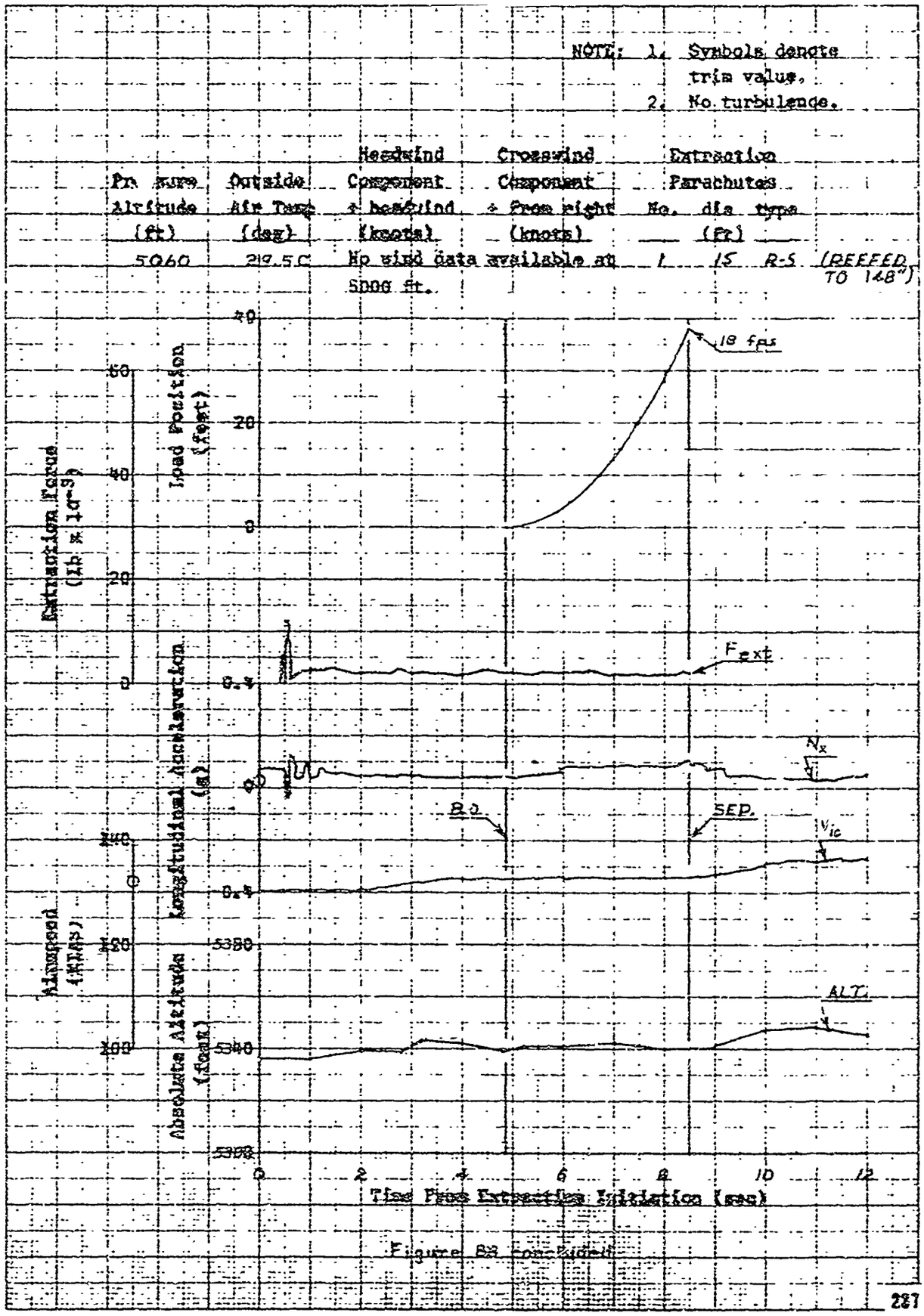


Figure 82 Concluded

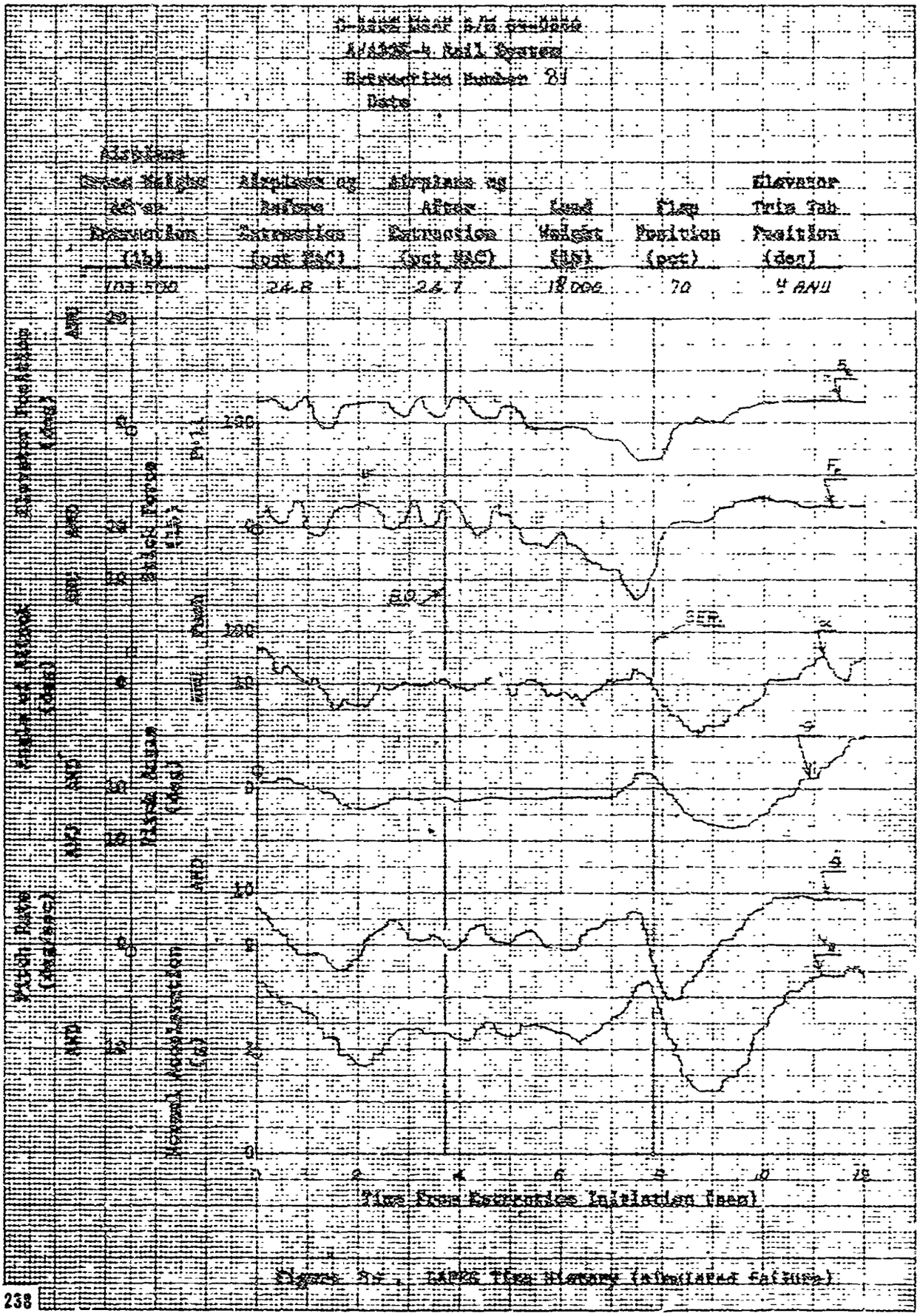


Figure 3-8. [illegible] Time History (Simulated Failure)

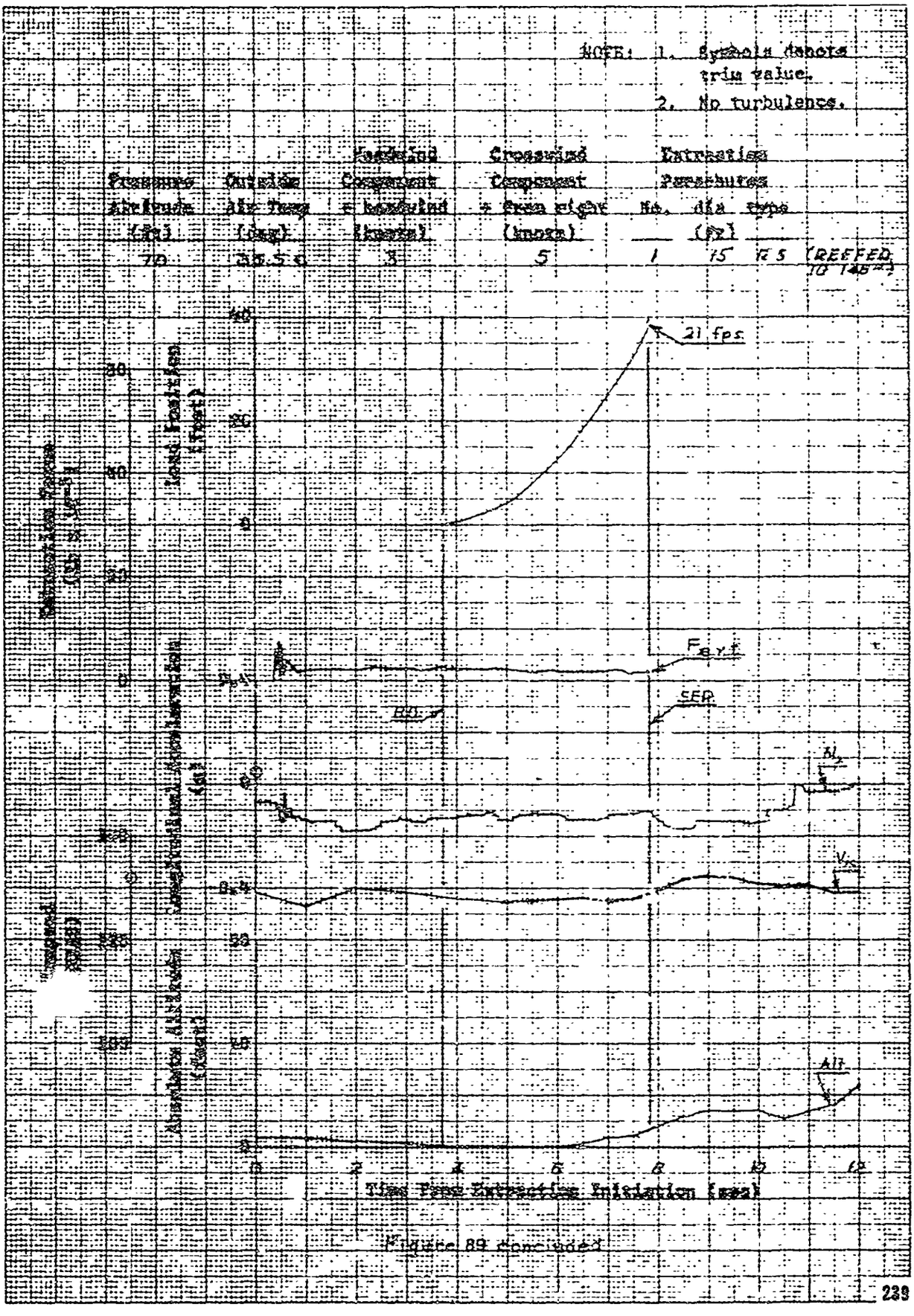
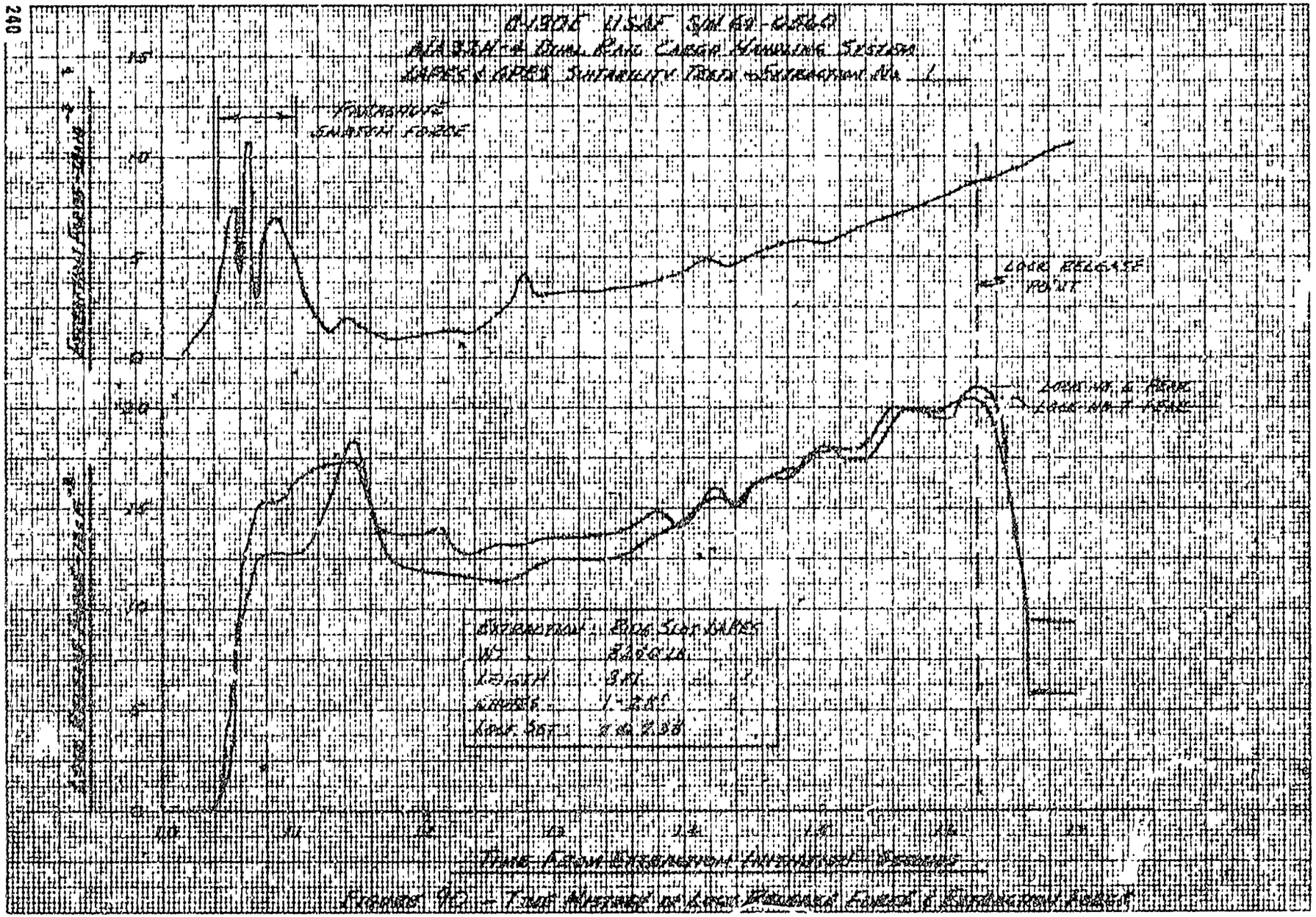
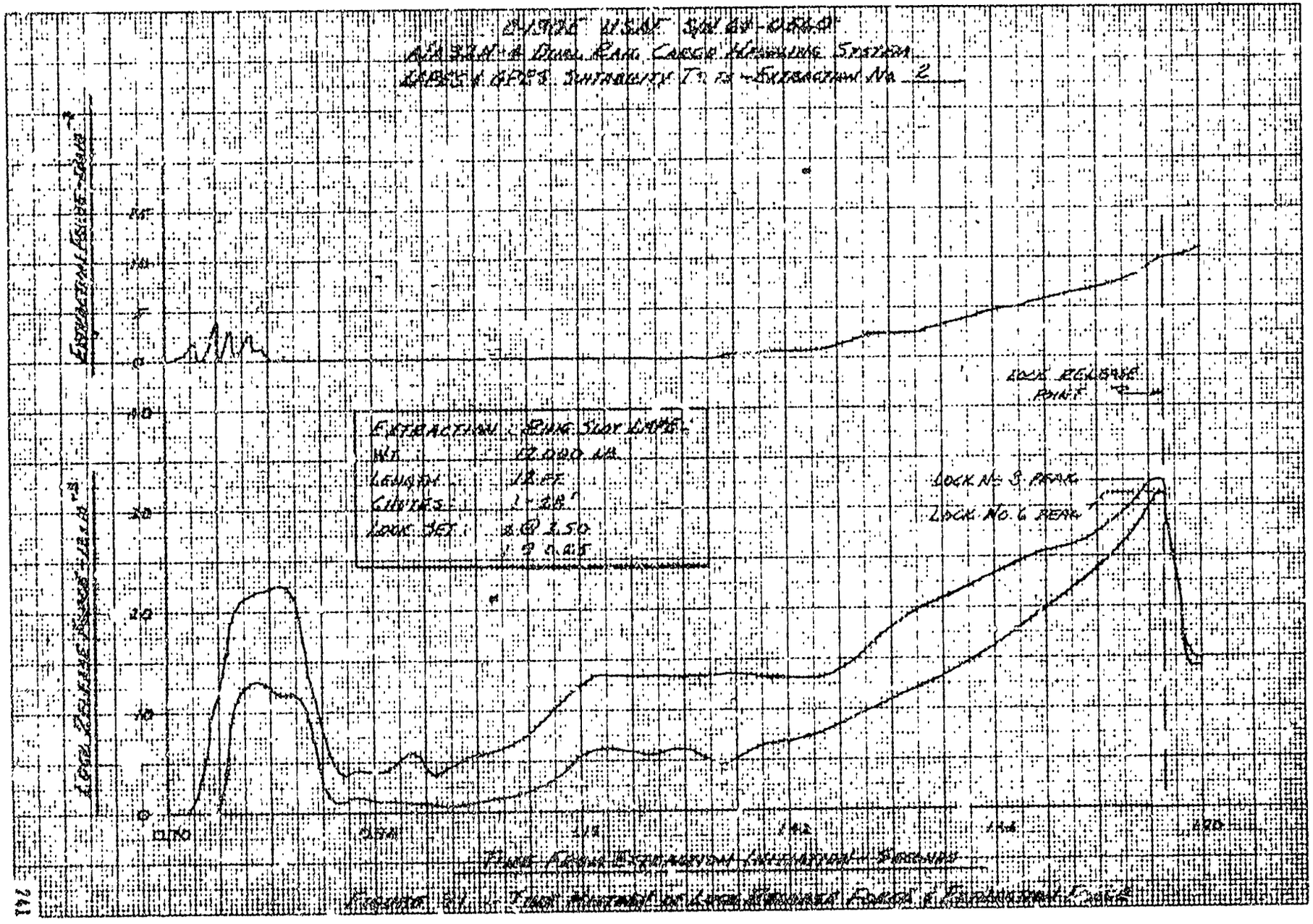


Figure 89 Concluded




EXTRACTION RING SLOT LOSS
LOCK ECCENTRIC POINT
LOCK No. 5 PEAK
LOCK No. 6 PEAK

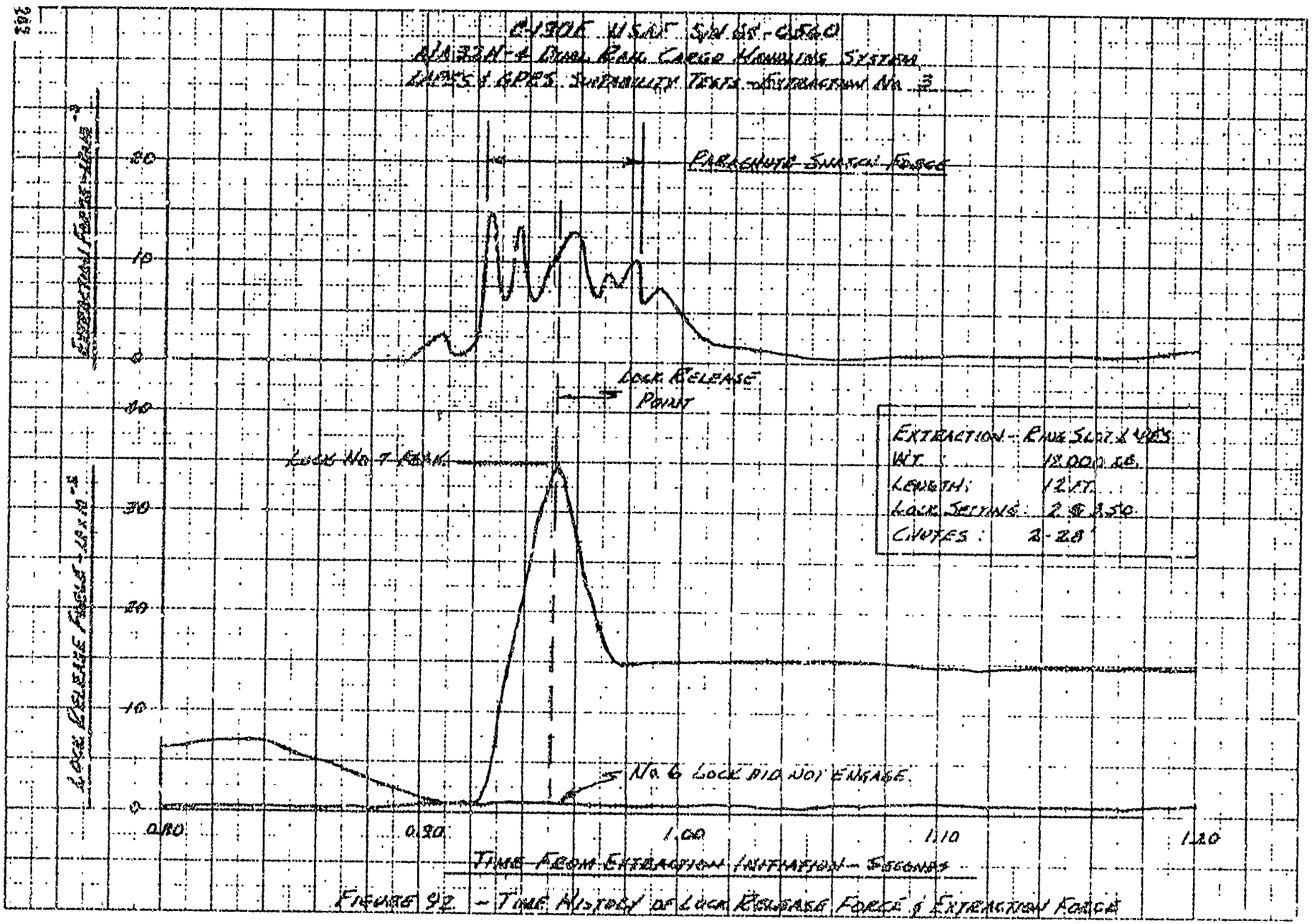


FIGURE 92 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE

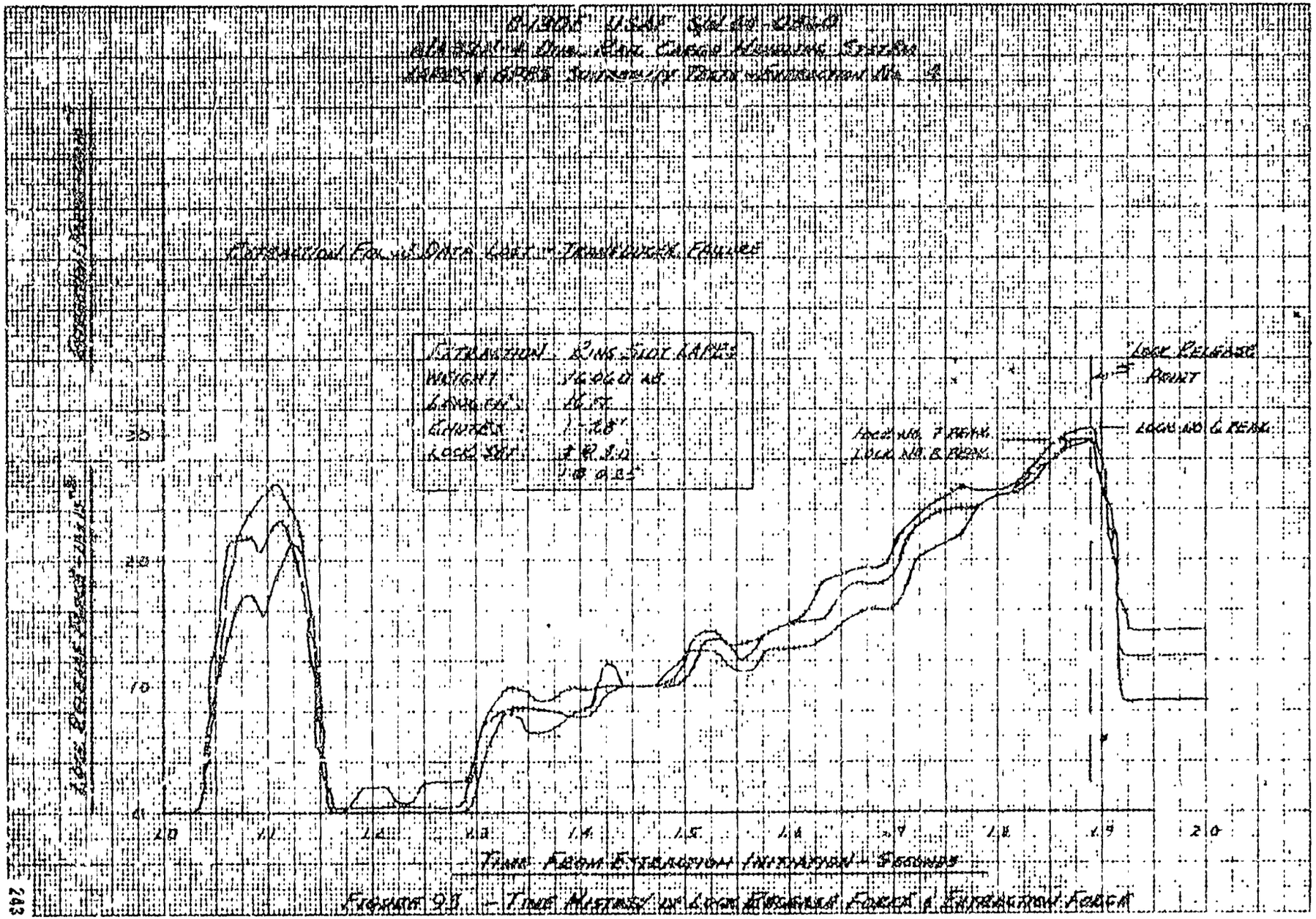
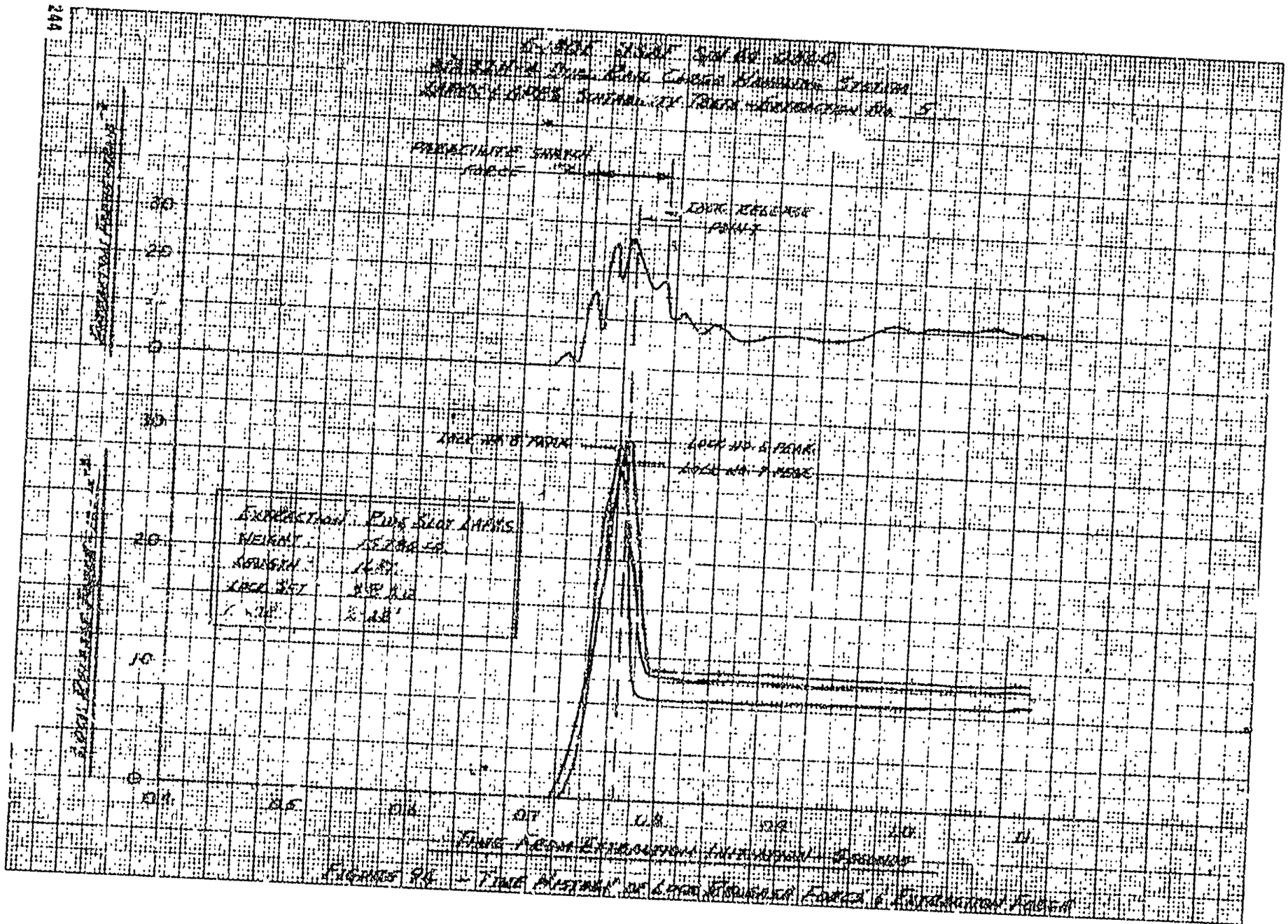
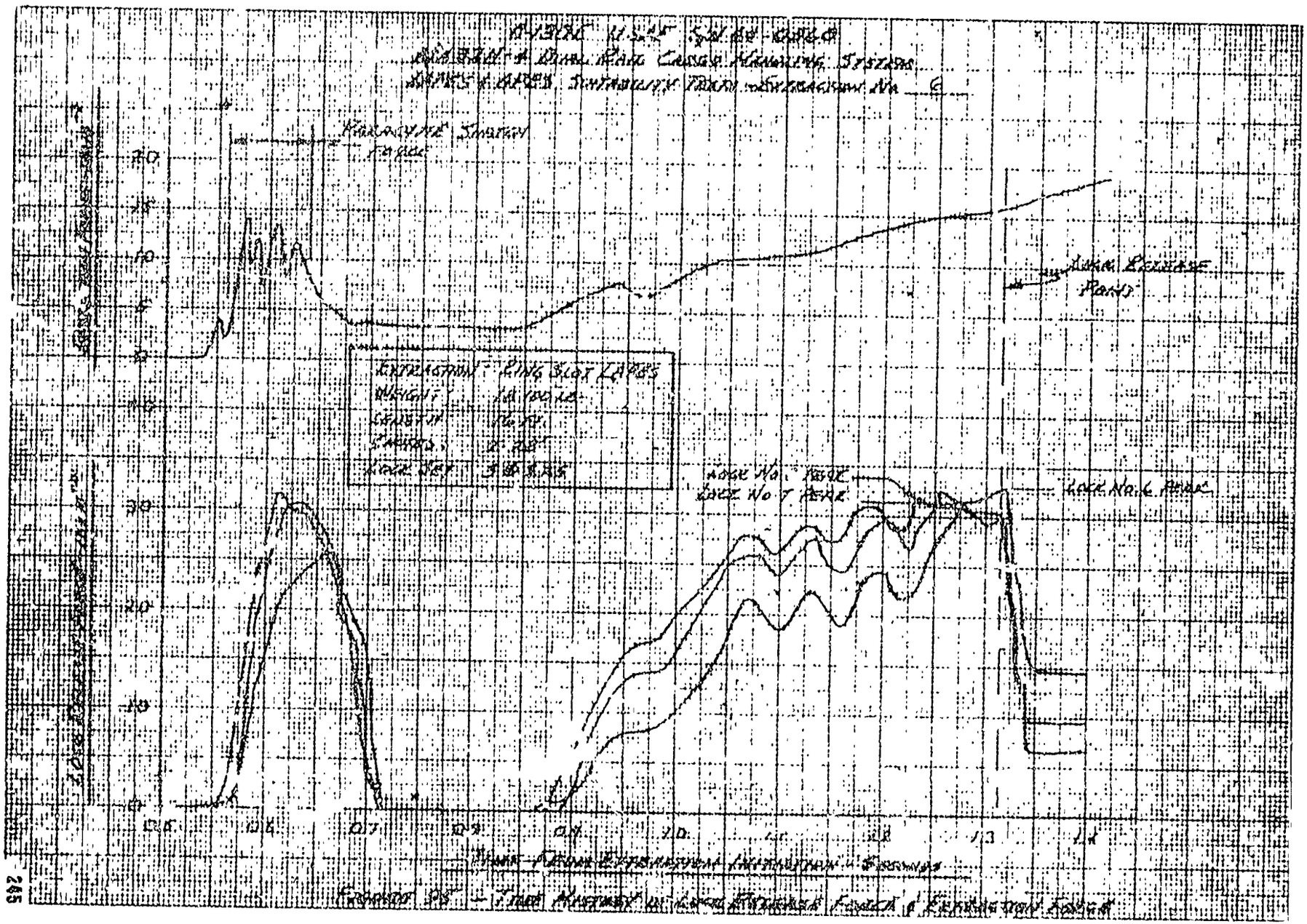
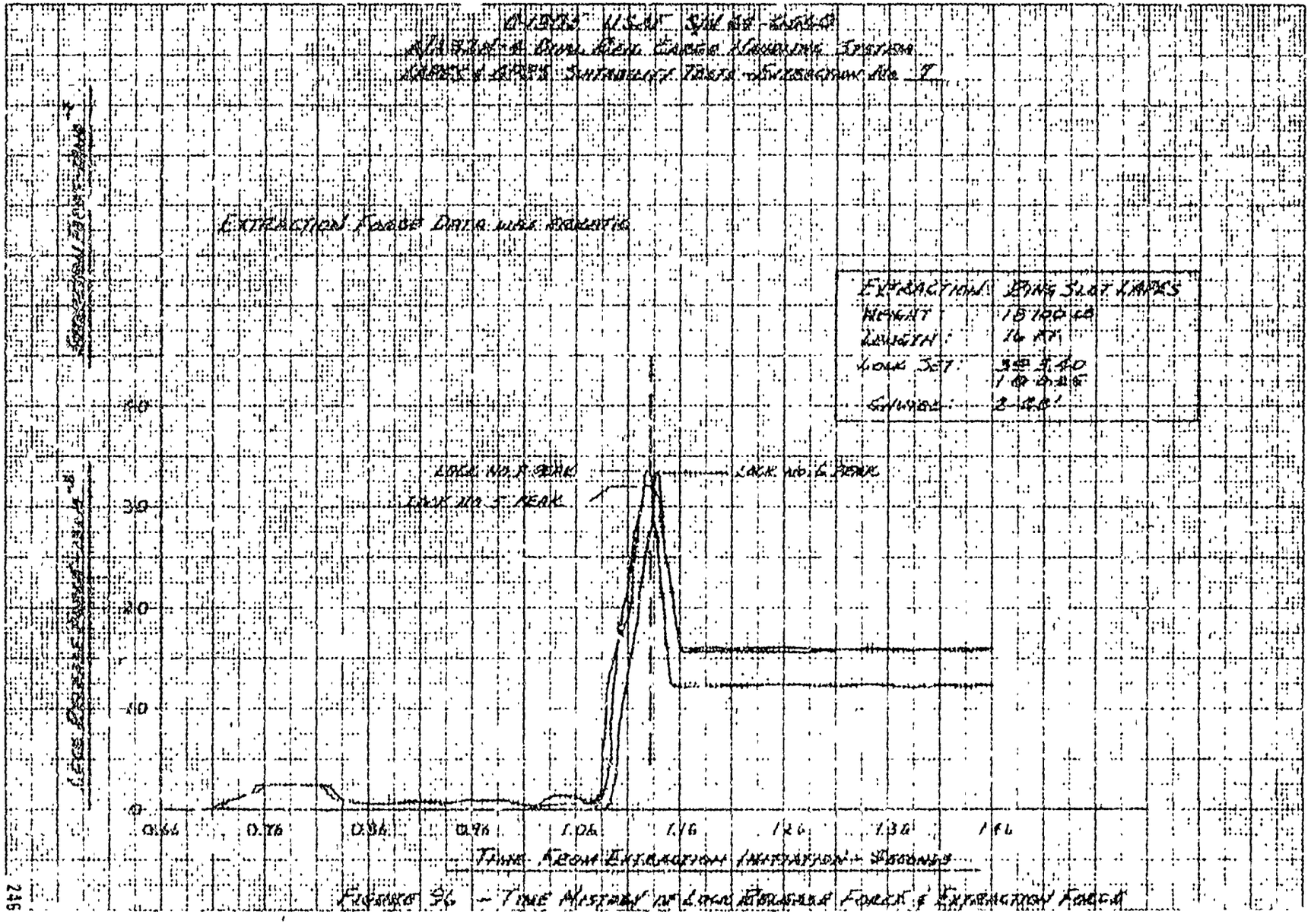


Figure 91 – Time History of Lock Release Force and Extension Force


PREDICTIVE SHEAR FORCE
LOCK RELEASE PEAK
LOCK NO. 8 PEAK
LOCK NO. 5 PEAK
LOCK NO. 4 PEAK
EXPECTATION PURE SHEAR ARMS
WEIGHT
HOUSING
LOCK SET
TIME




EXTRACTION FORCE DATA WAS MAGNETIC
EXTRACTION FORCE DATA WAS MAGNETIC
EXTRACTION BOND SLOT KAMAS
HEIGHT 18 100 GA
LENGTH 16 AT
LOAD 3-7 3 @ 3.40
1 @ 0.26
GAUGES 2-GA
LOCK NO. 2 PEAK
LOCK NO. 1 PEAK
LOCK NO. 1 PEAK
0.66
0.76
0.86
0.96
1.06
1.16
1.26
1.36
1.46
TIME FROM EXTRACTION INITIATION - SECONDS
FIGURE 26 - TIME HISTORY OF LOCK FORCES & EXTRACTION FORCE

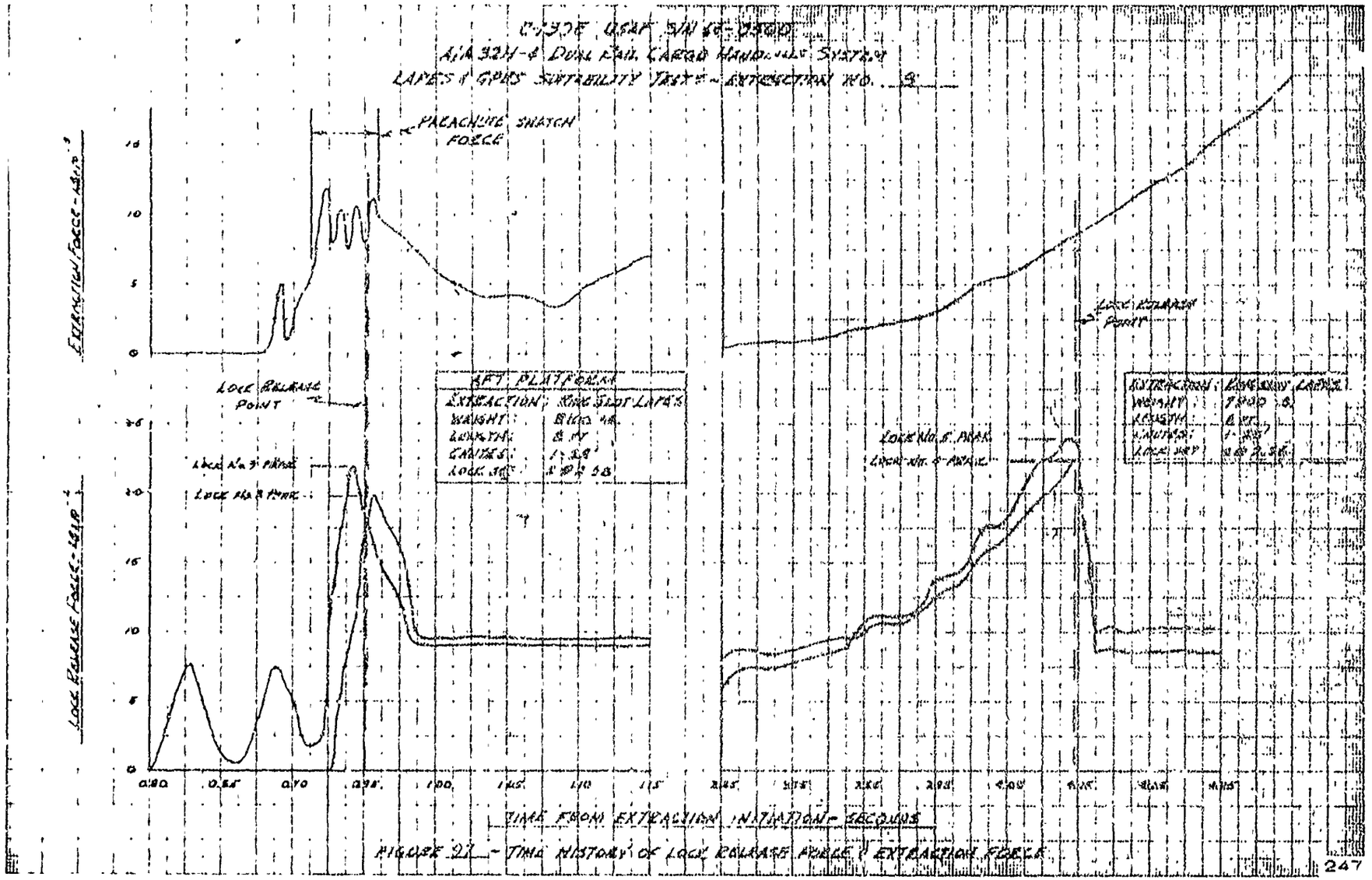


FIGURE 21 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE

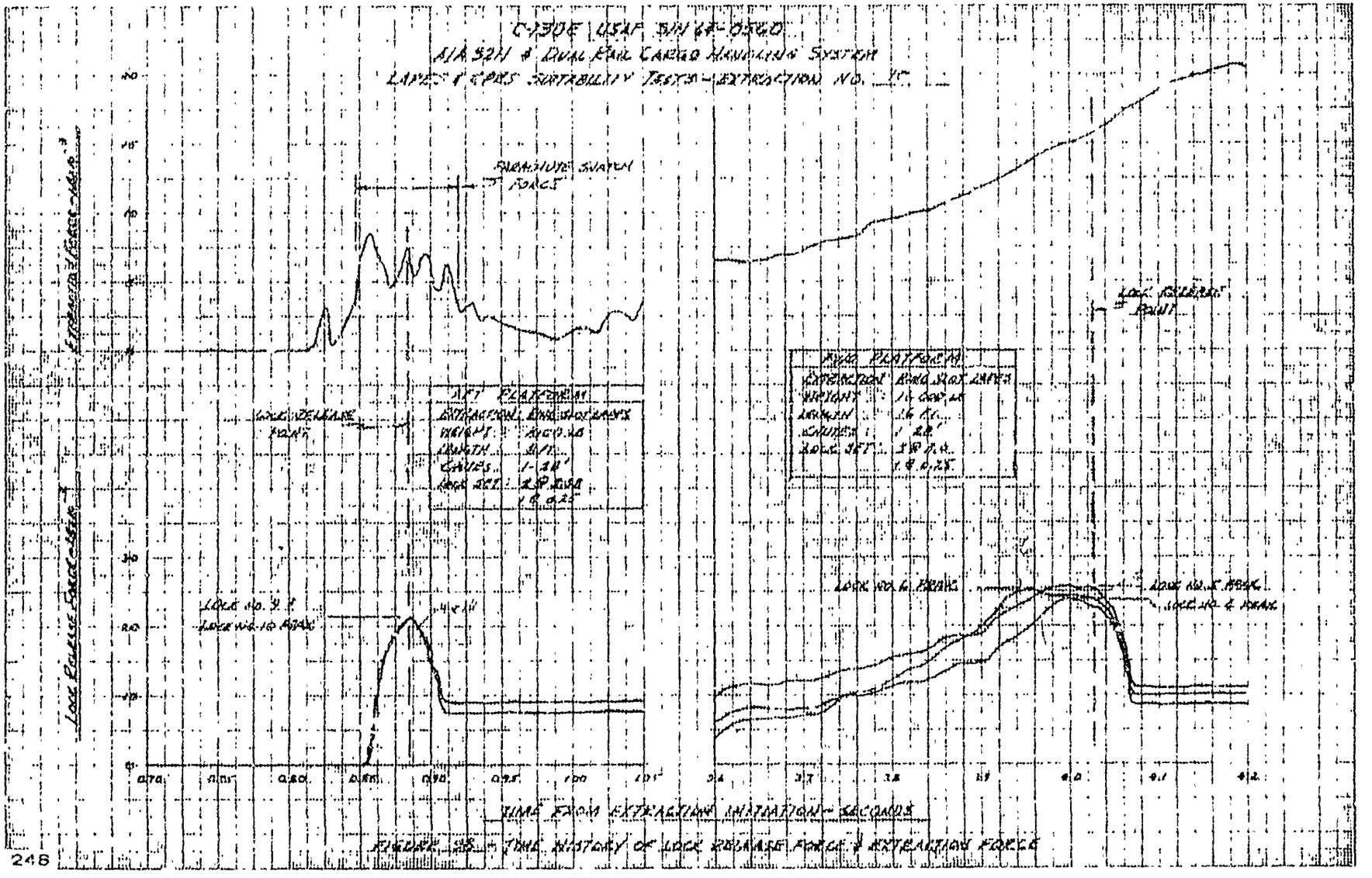


FIGURE 105 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCES

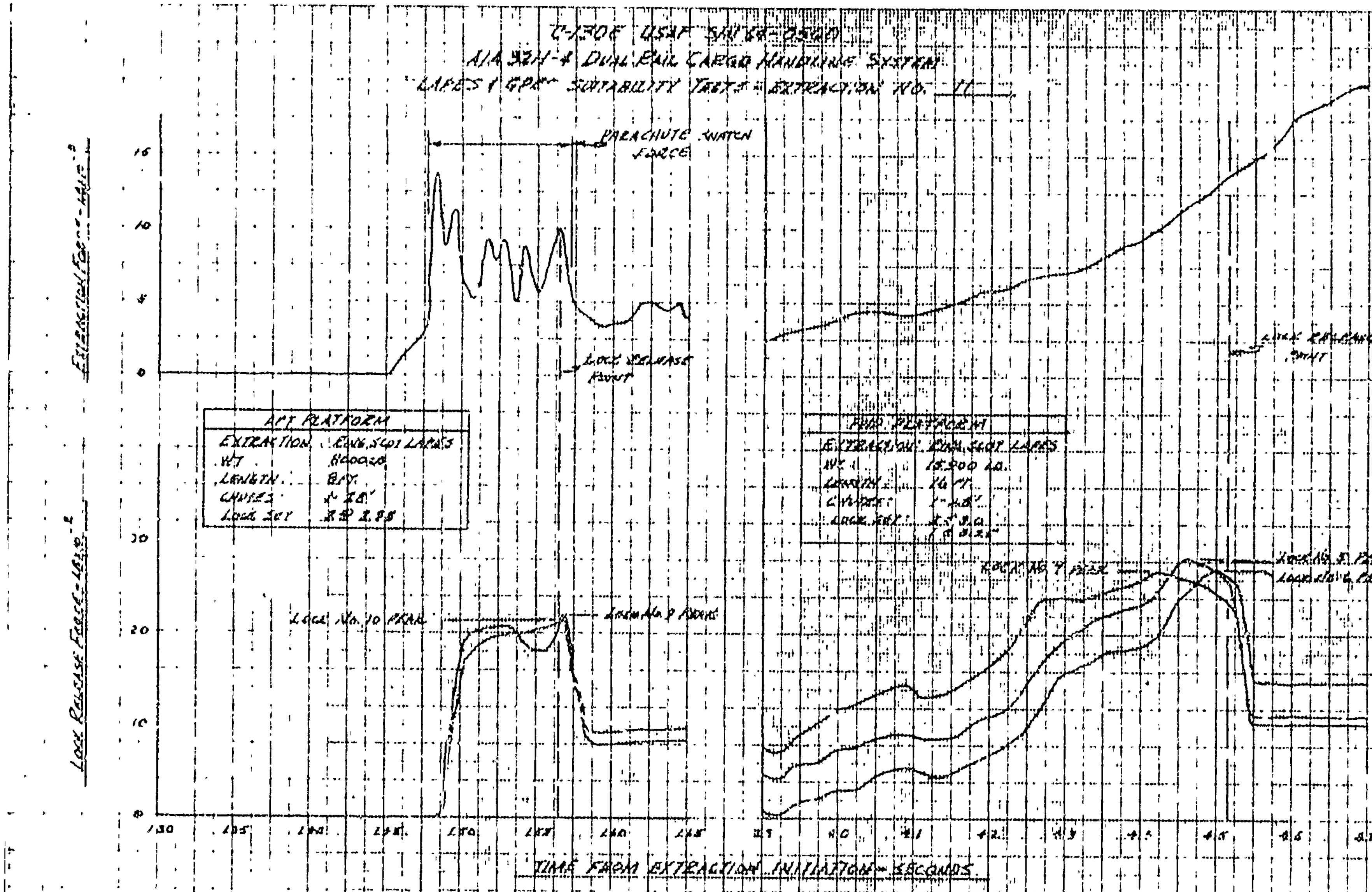


FIGURE 22 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE

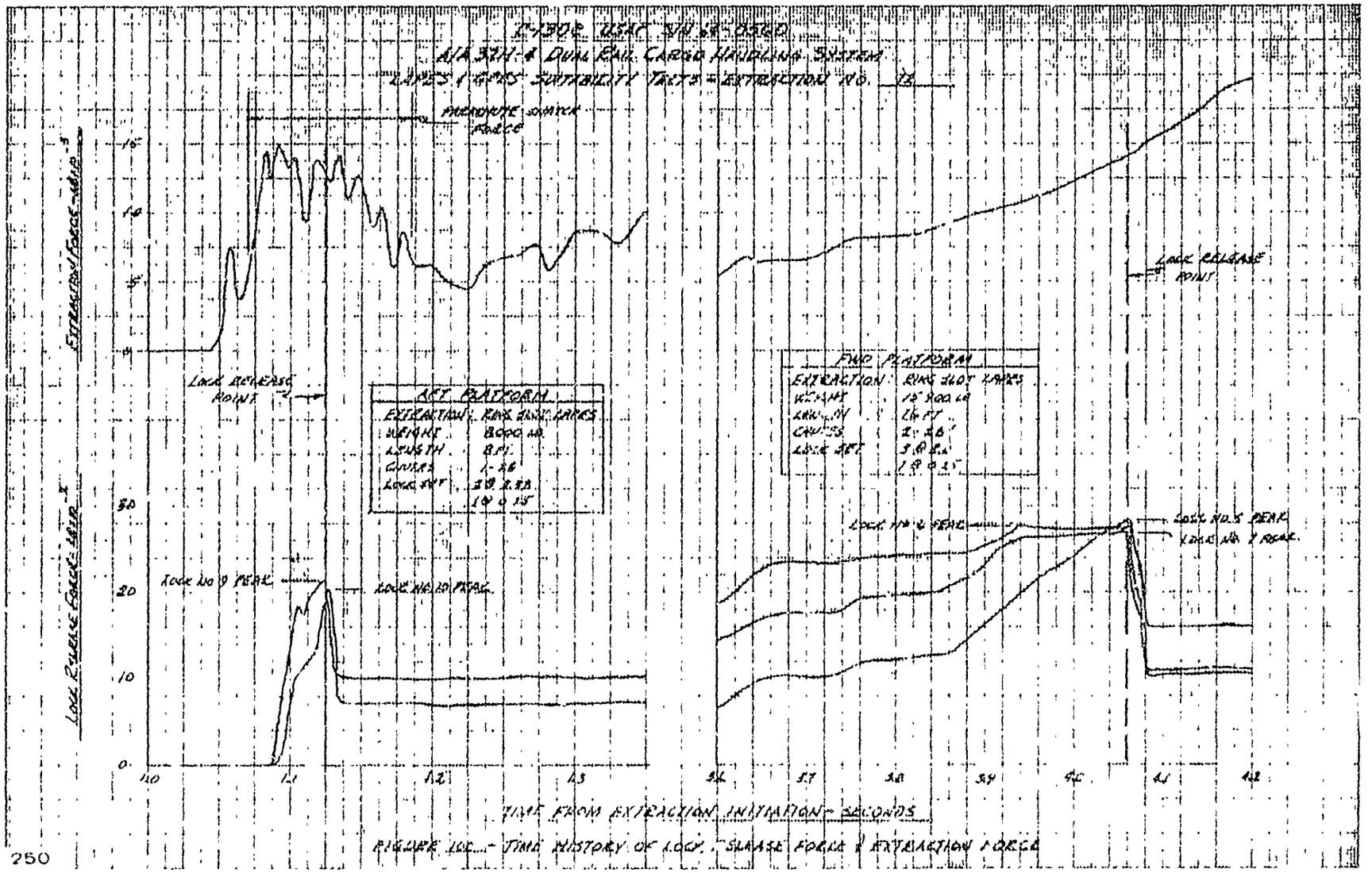


FIGURE 11C - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE

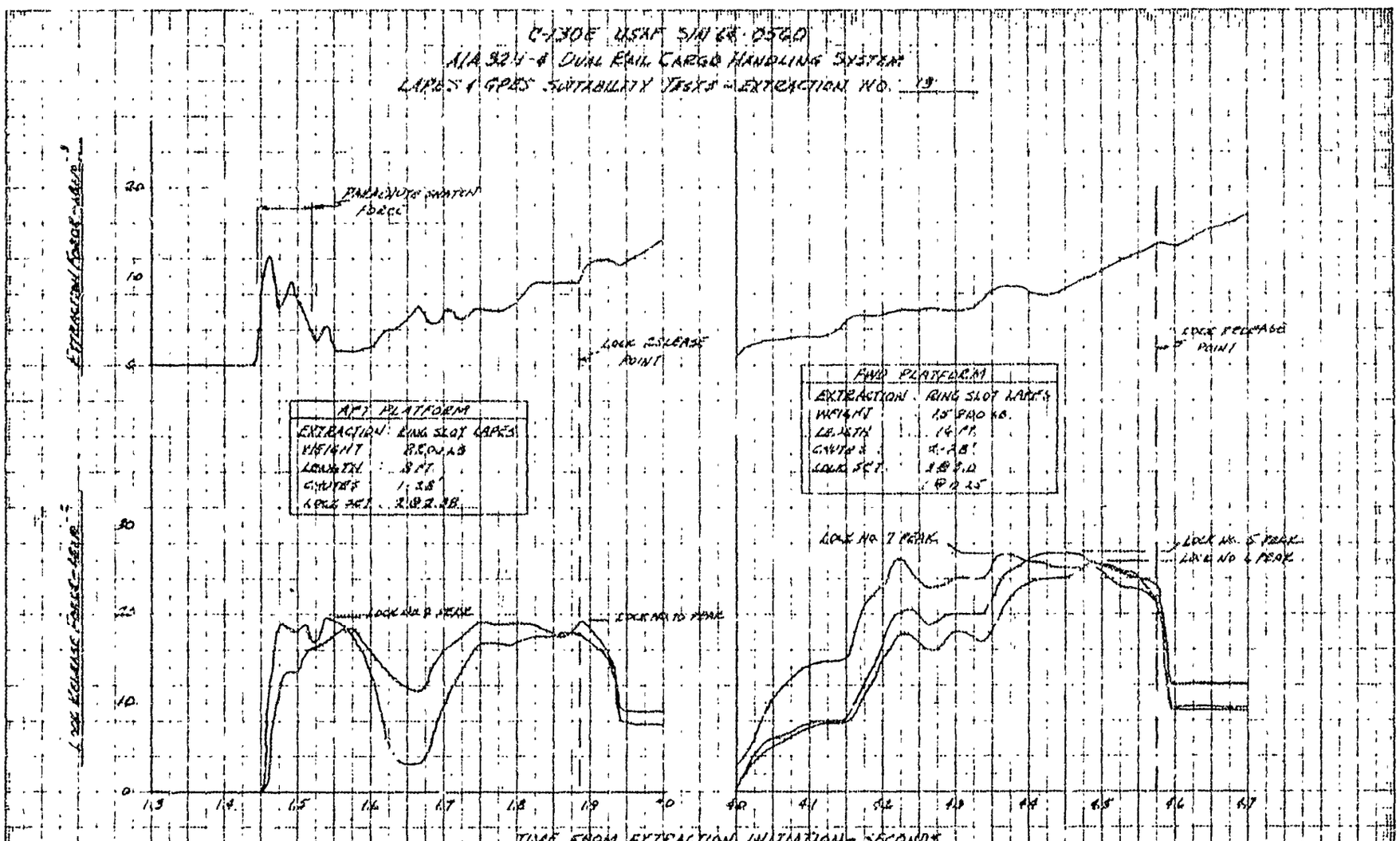
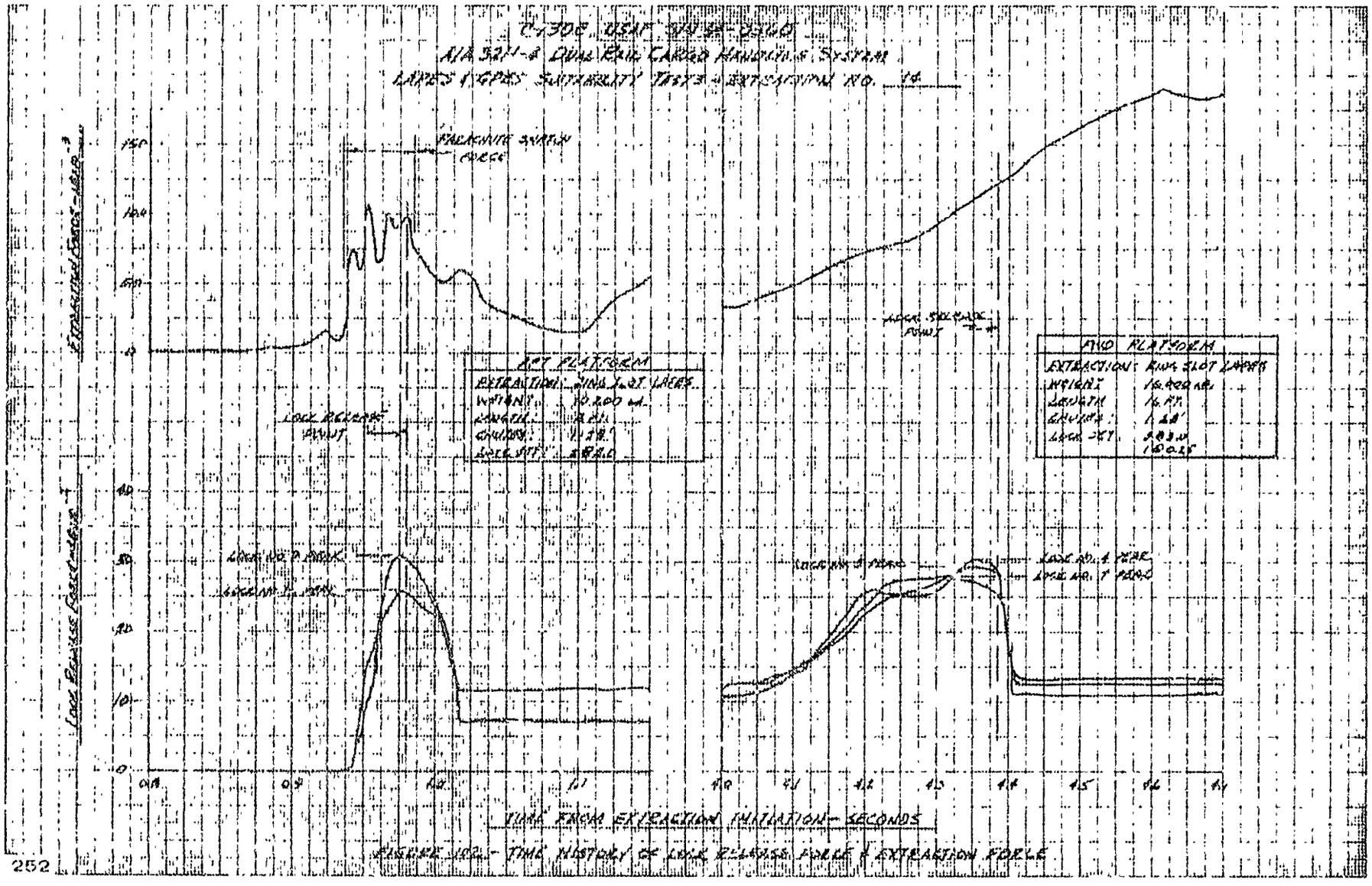


FIGURE 101 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE


F-30C USAF NO. 52-3960
AIM 54A-4 LONG RNG CARRIER MANEUVER SYSTEM
LAUNCH & GPAS SUITABILITY TESTS - EXTRACTION NO. 16
MACH NO.
ALTITUDE - 1000 FT
LOCK RELEASE POINT
MACH SQUARE POINT
ACT PLATFORM
EXTRACTION: WING SLOT LAUNCH
WEIGHT: 10,200 LB
LENGTH: 38 FT
GAUGE: 11 3/8"
LOCK SET: 4 PEG
AIMD PLATFORM
EXTRACTION: WING SLOT LAUNCH
WEIGHT: 10,200 LB.
LENGTH: 38 FT.
GAUGE: 11 3/8"
LOCK SET: 4 PEG
LOCK RELEASE POINT
LOCK NO. 2 PEAK
LOCK NO. 1 PEAK
LOCK NO. 2 PEAK
LOCK NO. 1 PEAK
LOCK RELEASE FORCE - LBS.
TIME FROM EXTRACTION INITIATION - SECONDS
FIGURE 102 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE

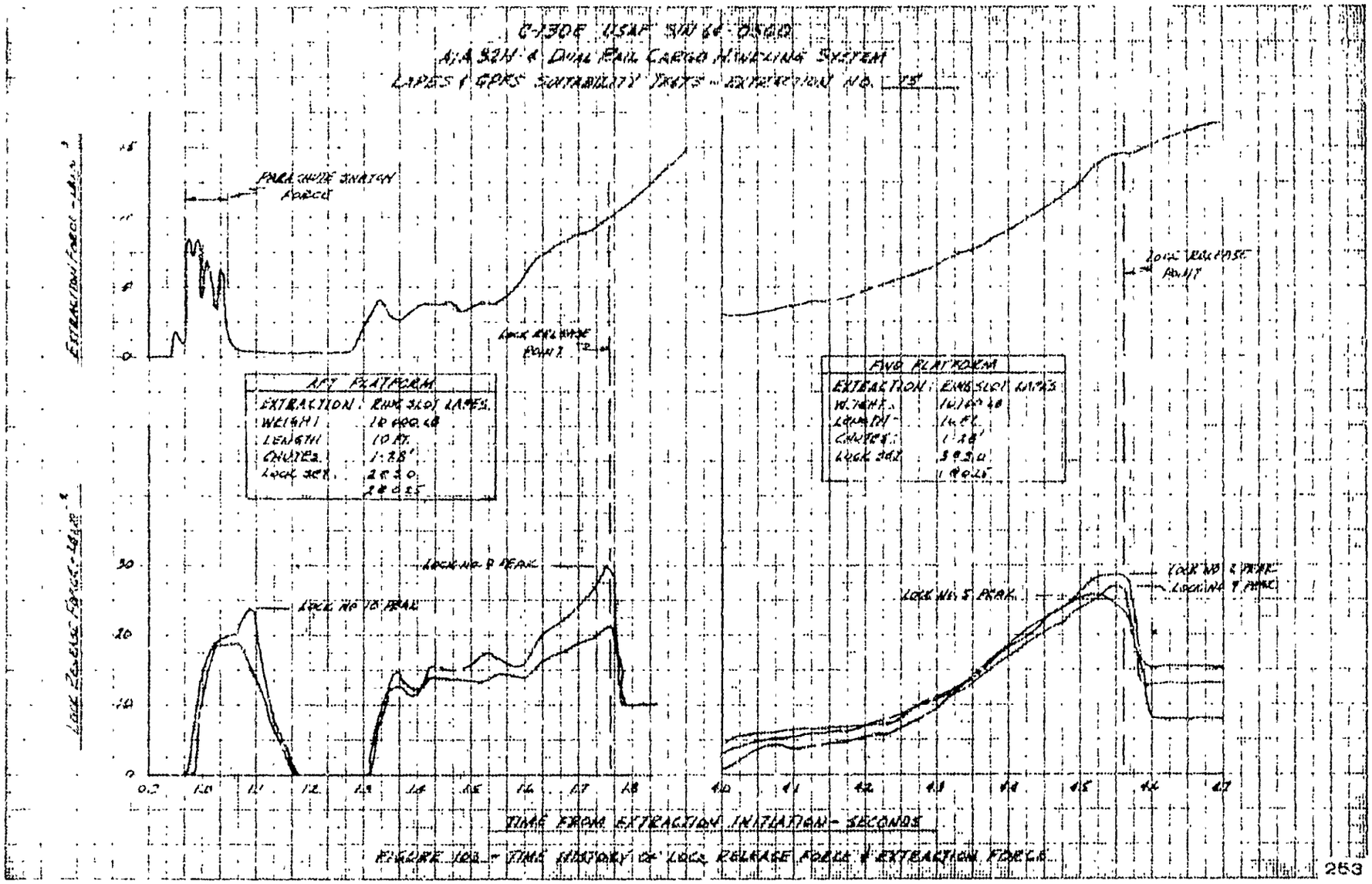


FIGURE 108 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE

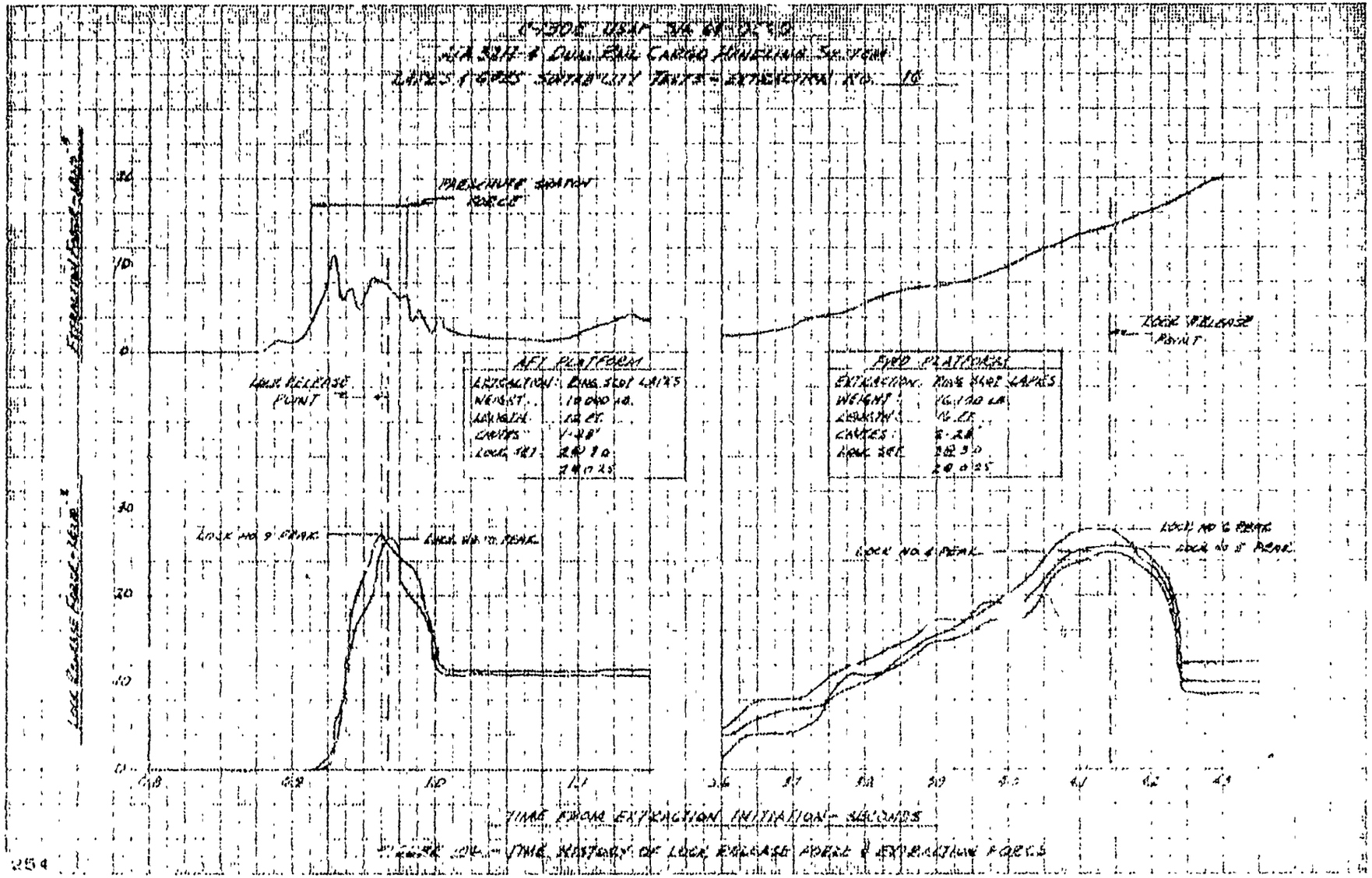
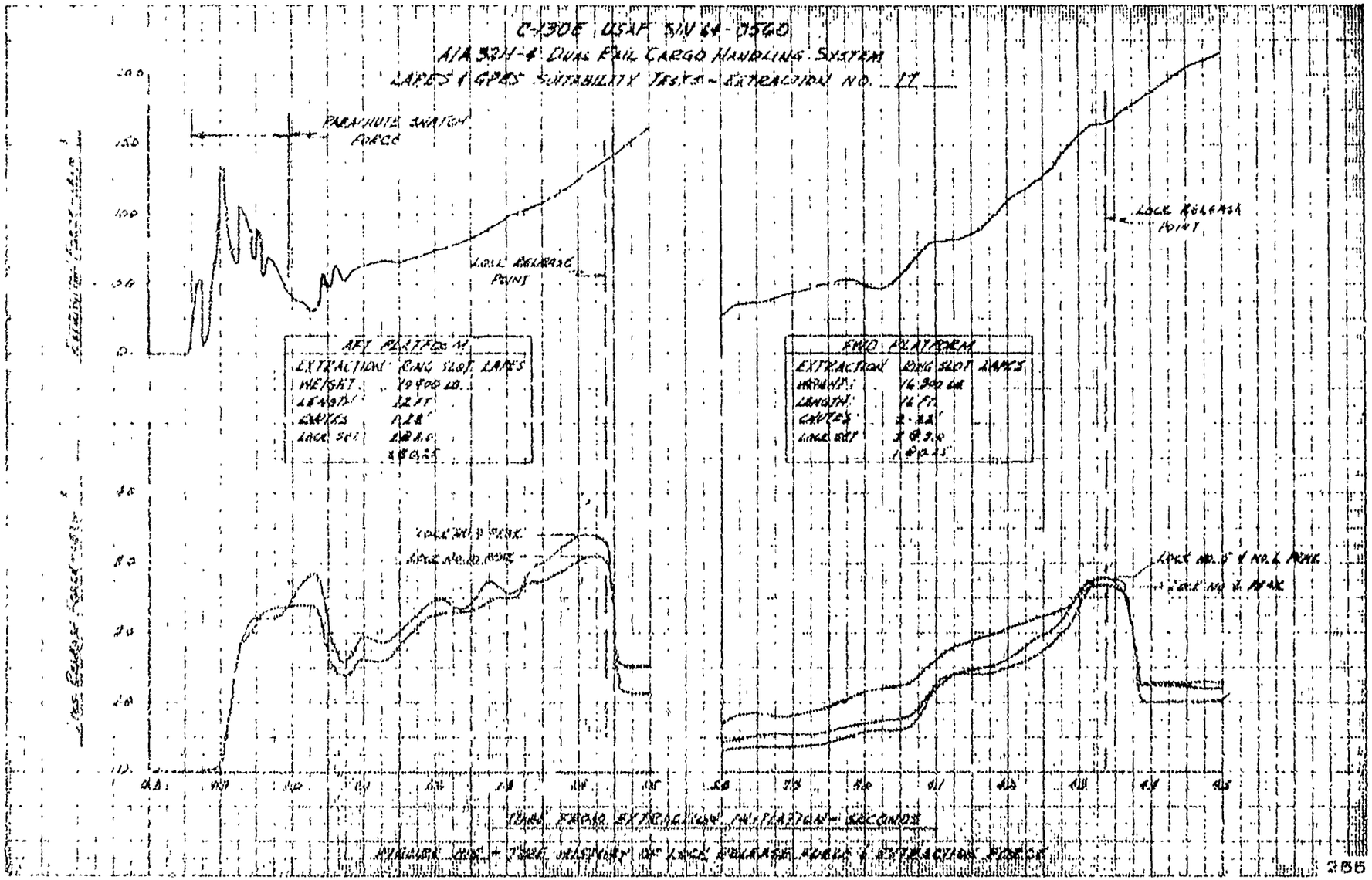
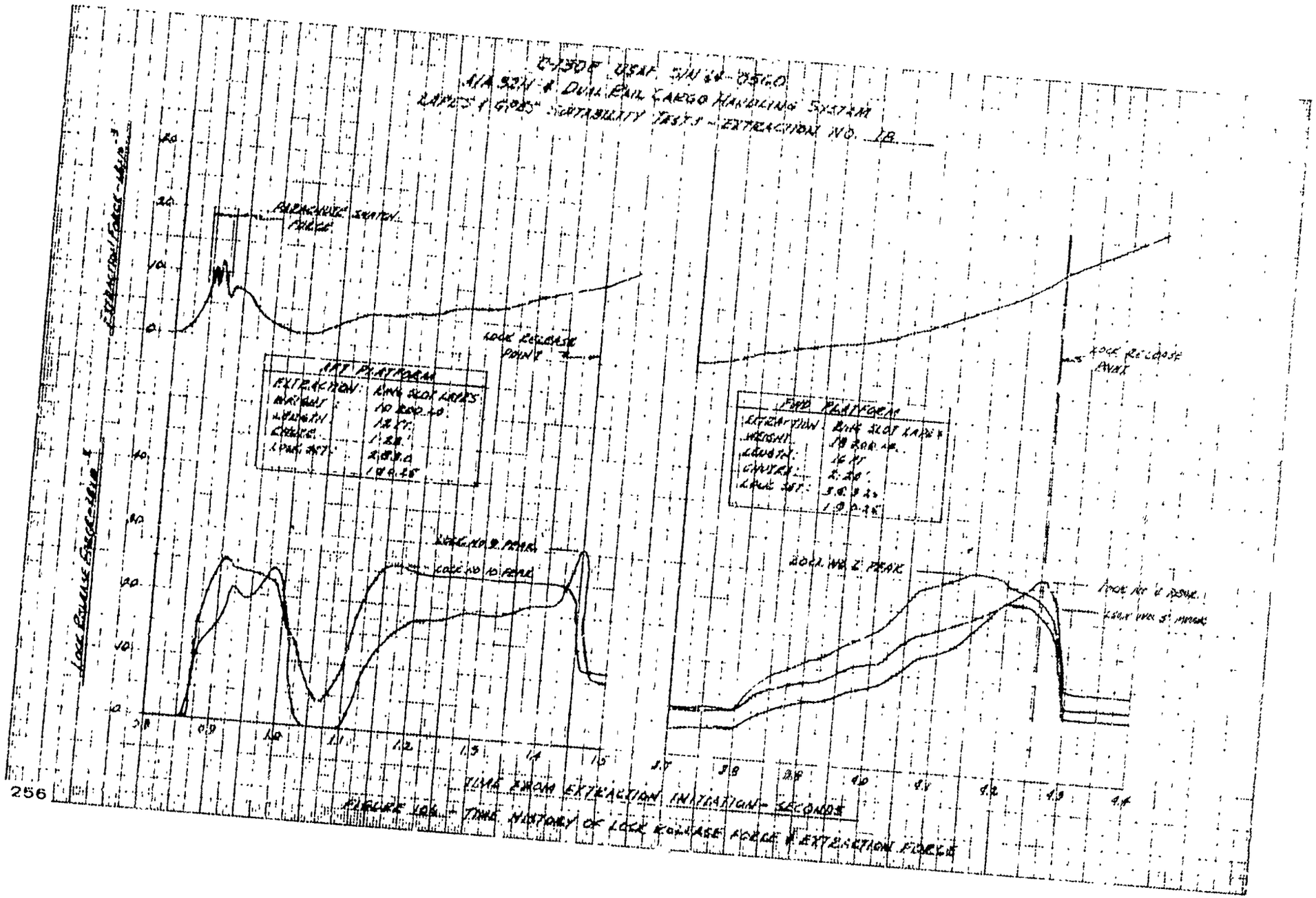


FIGURE 204 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCES


C-130E USAF S/N 64-0560
AIA 32H-4 DUAL FWD CARGO HANDLING SYSTEM
LAPES / GPES SUITABILITY TESTS - EXTRACTION NO. 11
PARACHUTE SNATCH FORCE
LOCK RELEASE POINT
AFT PLATFORM
EXTRACTION
WEIGHT 70,000 LB.
LENGTH 22 FT
CENTER
LOCK SET
FWD PLATFORM
EXTRACTION
LONG SLOT LAMPS
WEIGHT 16,300 LB
LENGTH 16 FT
CENTER
LOCK SET
LOCK RELEASE POINT
LOCK RELEASE POINT
LOCK RELEASE POINT
TIME FROM EXTRACTION INITIATION - SECONDS
AVERAGE LOCK RELEASE FORCE VS EXTRACTION FORCE


C-130E USAF S/N 64-0560
AIA 92N & DUAL RAIL CARGO HANDLING SYSTEM
24"x 5'-1" G085 CERTIFICATION TEST - EXTRACTION NO. 18
EXTRACTION FORCE - KIPS
LOCK RELEASE SWITCH FORCE
LOCK RELEASE POINT
FORCE RECORDED AFT
AFT PLATFORM
EXTRACTION WEIGHT
LINK SLOT LOADS
FWD PLATFORM
EXTRACTION WEIGHT
LINK SLOT LOADS
LOCK NO 2 PEAK
LOCK NO 1 PEAK
FORCE AT 2 PEAK
FORCE AT 1 PEAK
TIME FROM EXTRACTION INITIATION - SECONDS
FIGURE 108 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE

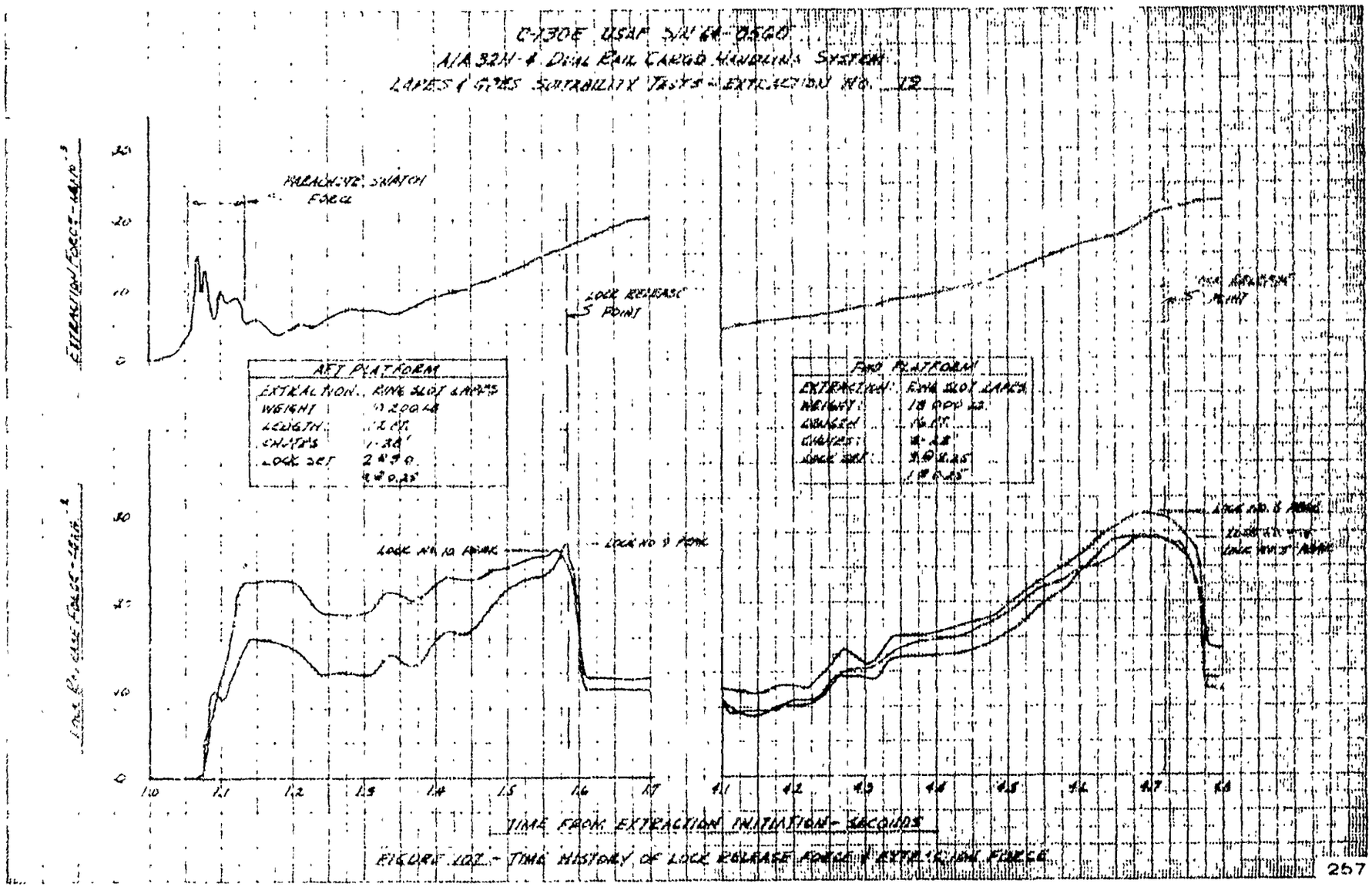


FIGURE 102 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE

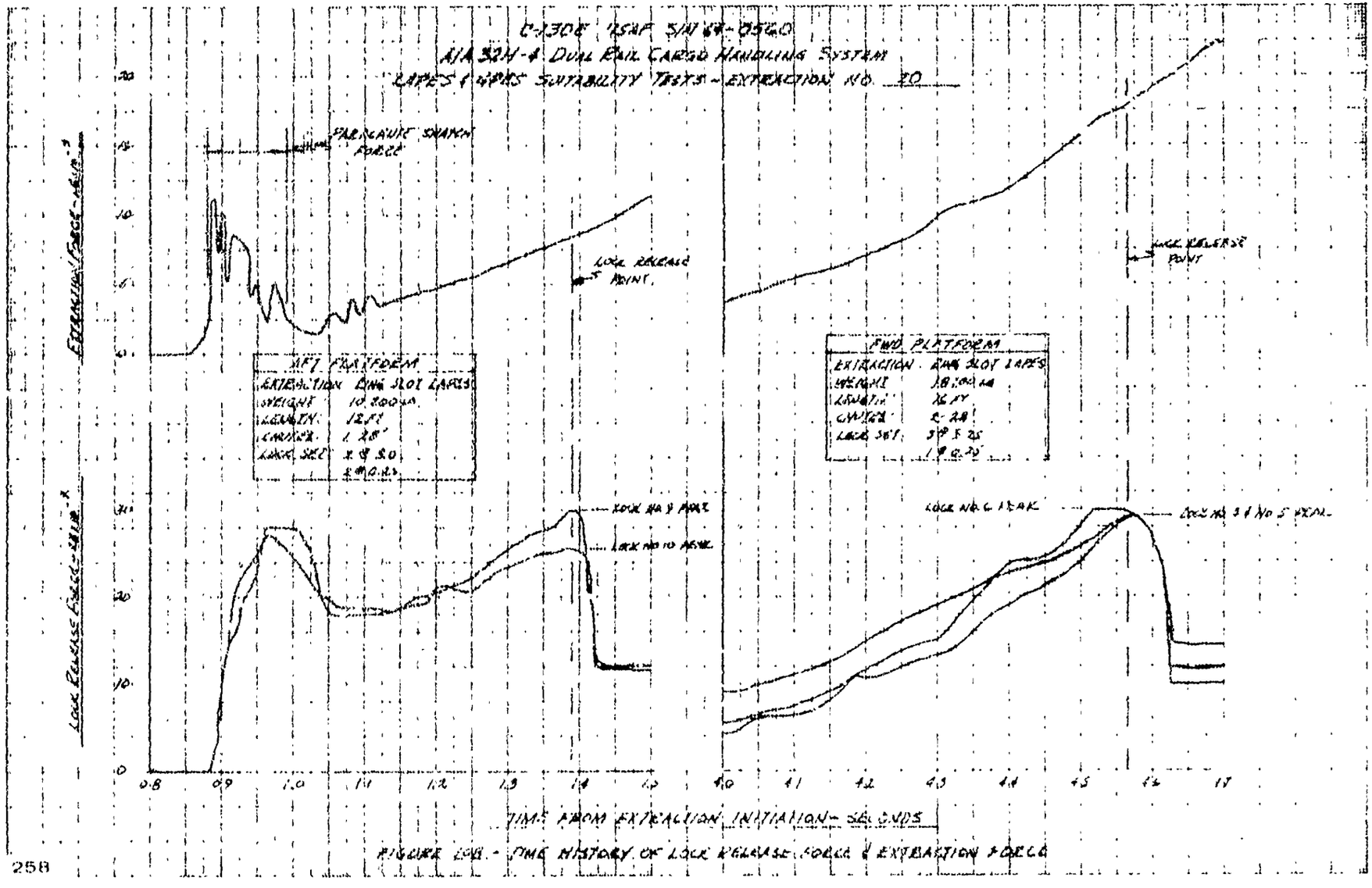


FIGURE 108 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE

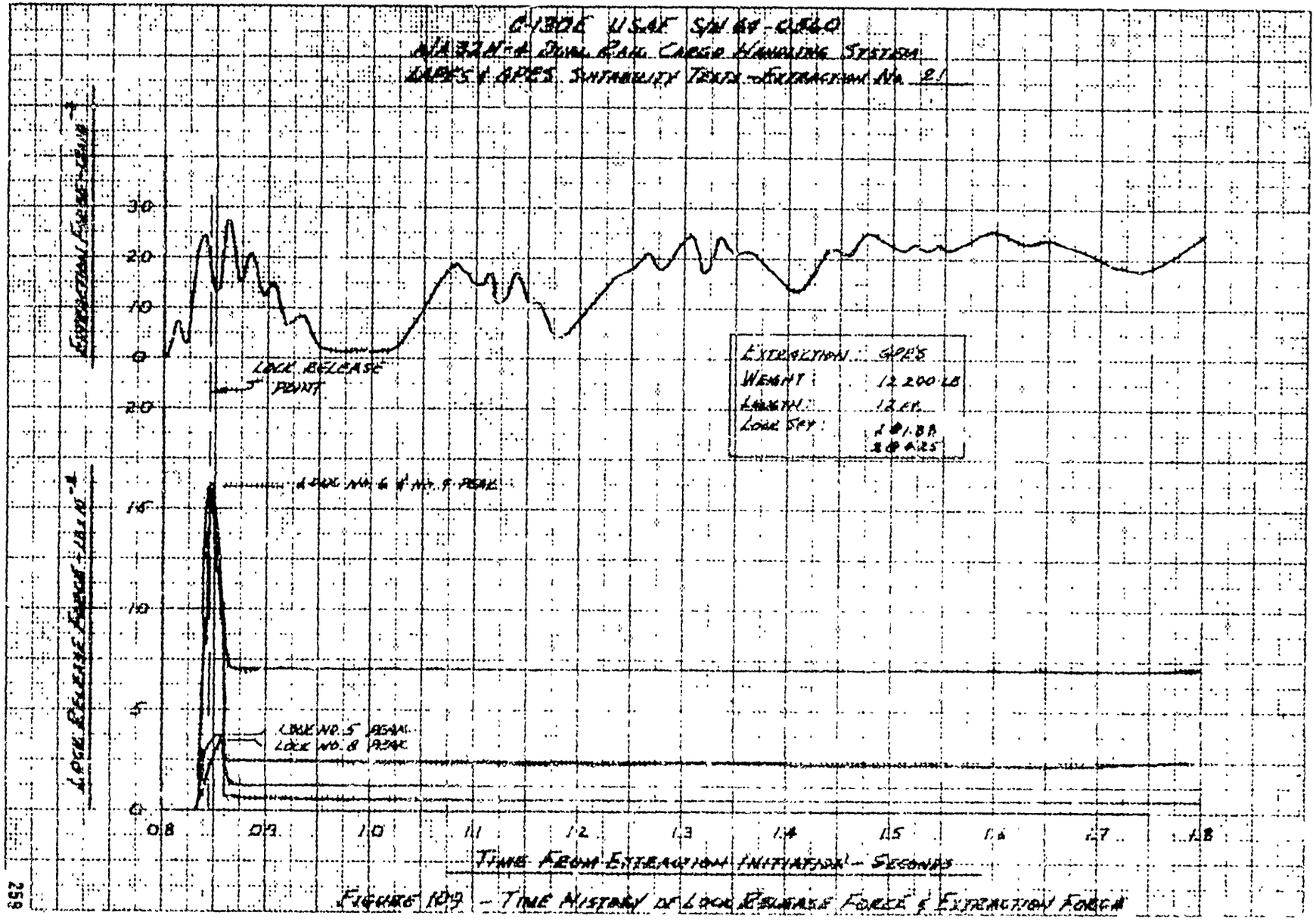


Figure 109 - Time History of Lock Release Force & Extraction Force

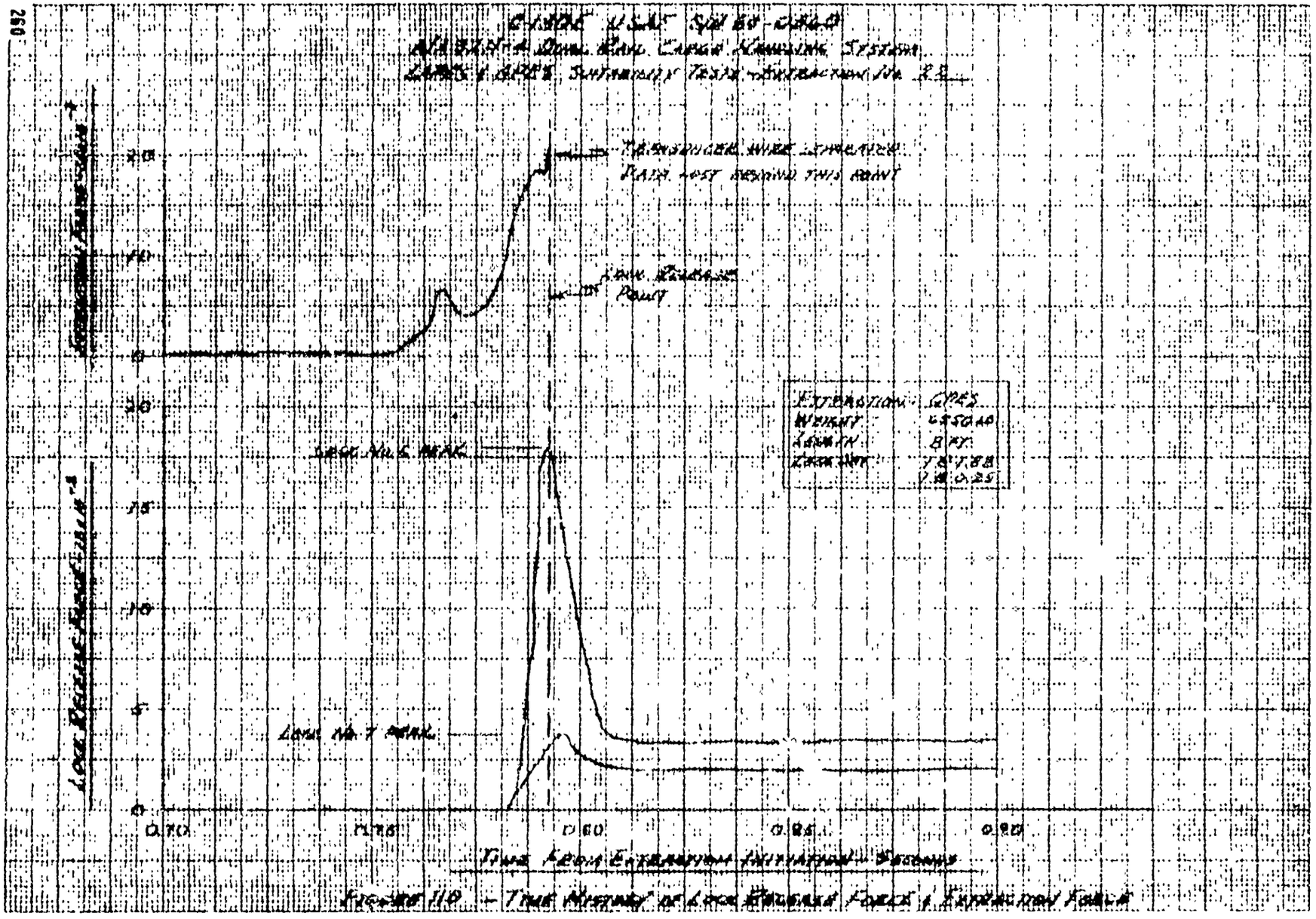
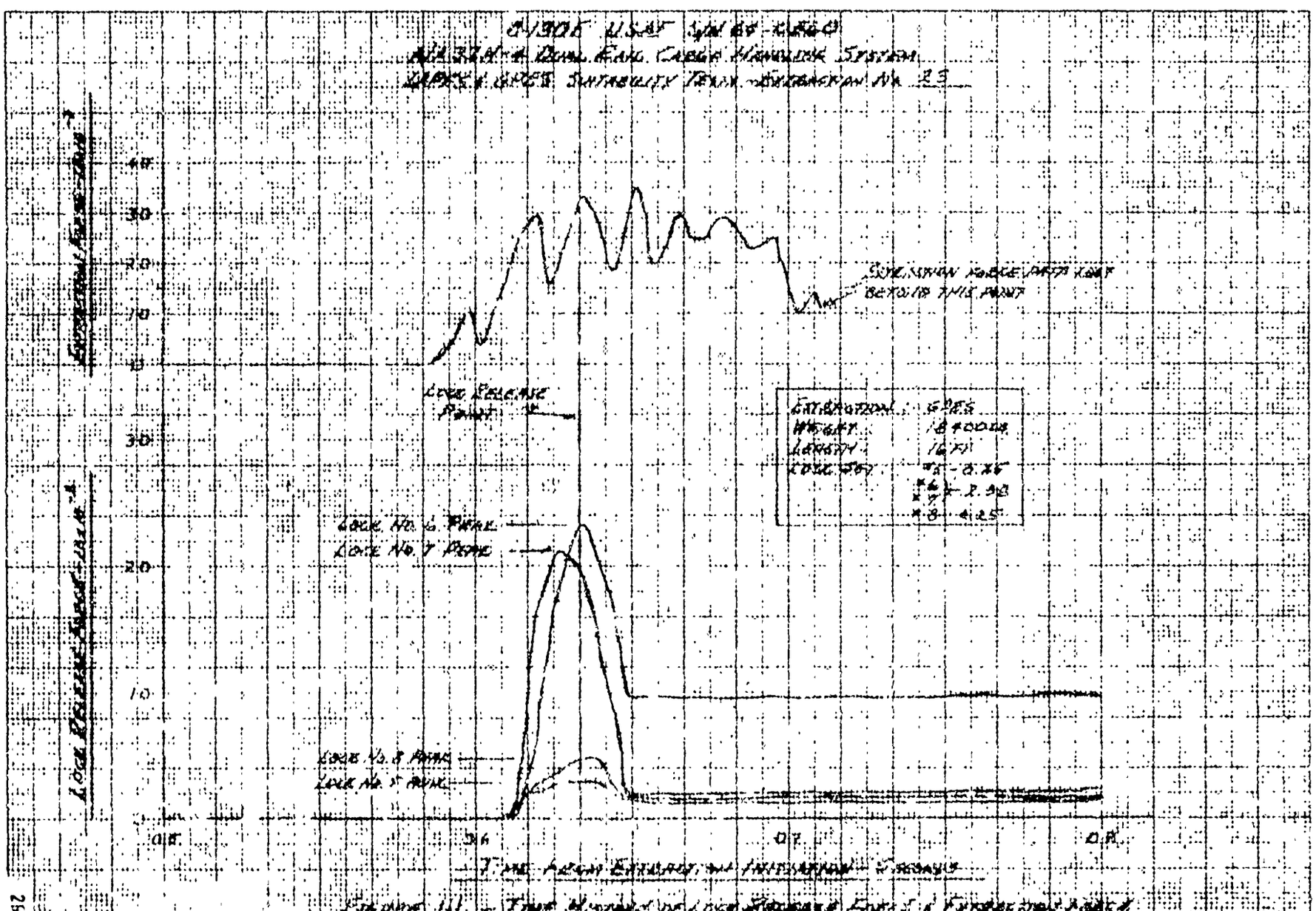


FIG. 110 - TIME HISTORY OF LOAD GAGE FORCE & EXPLOSION PULSE


Load Reliance Point
Load No. 6 Point
Load No. 7 Point
Load No. 8 Point
Load No. 9 Point
0.6
0.7
0.8

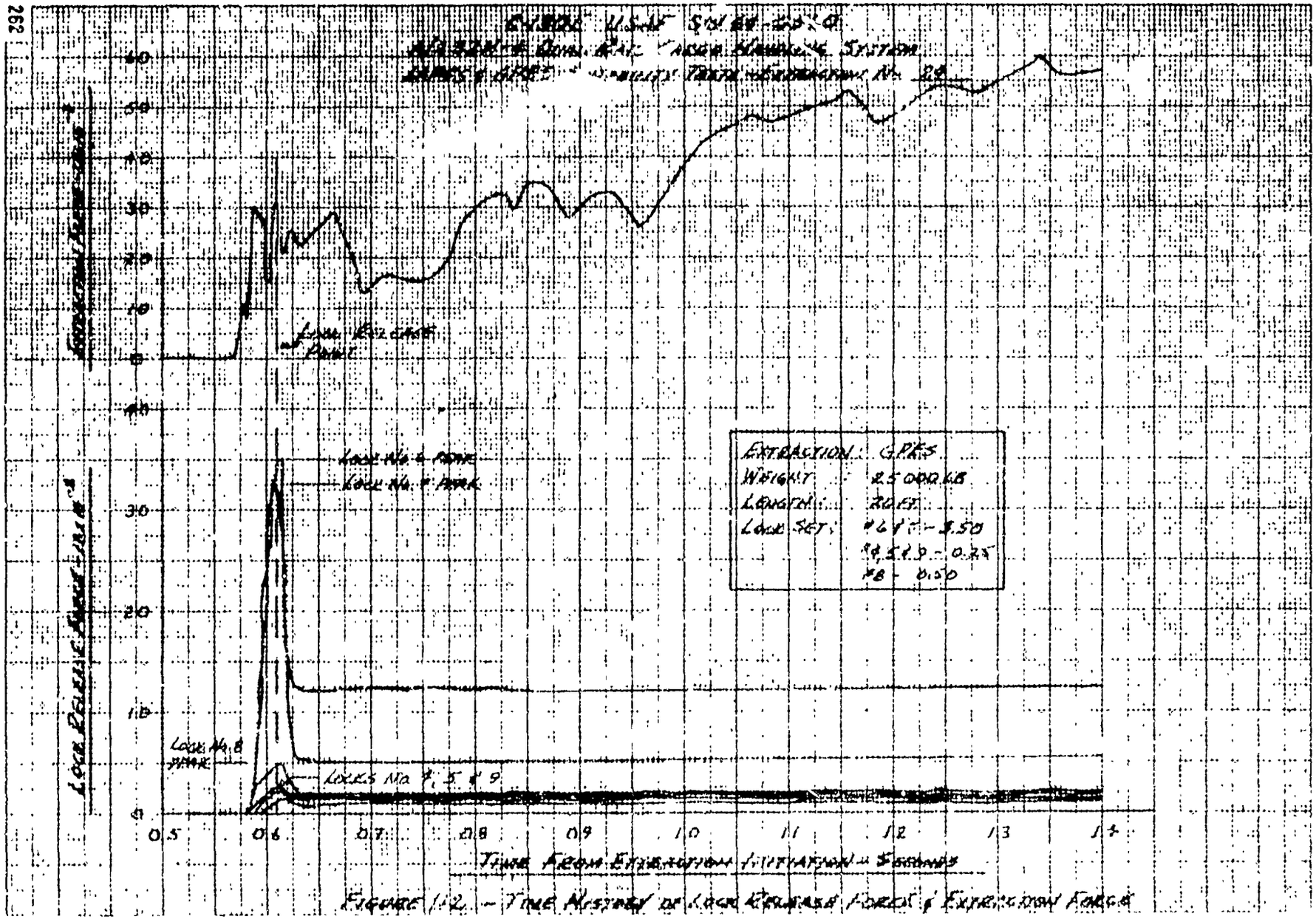


FIGURE 1.2 - TIME HISTORY OF LOCAL EXPOSED PANEL & EXTRACTION FORCE

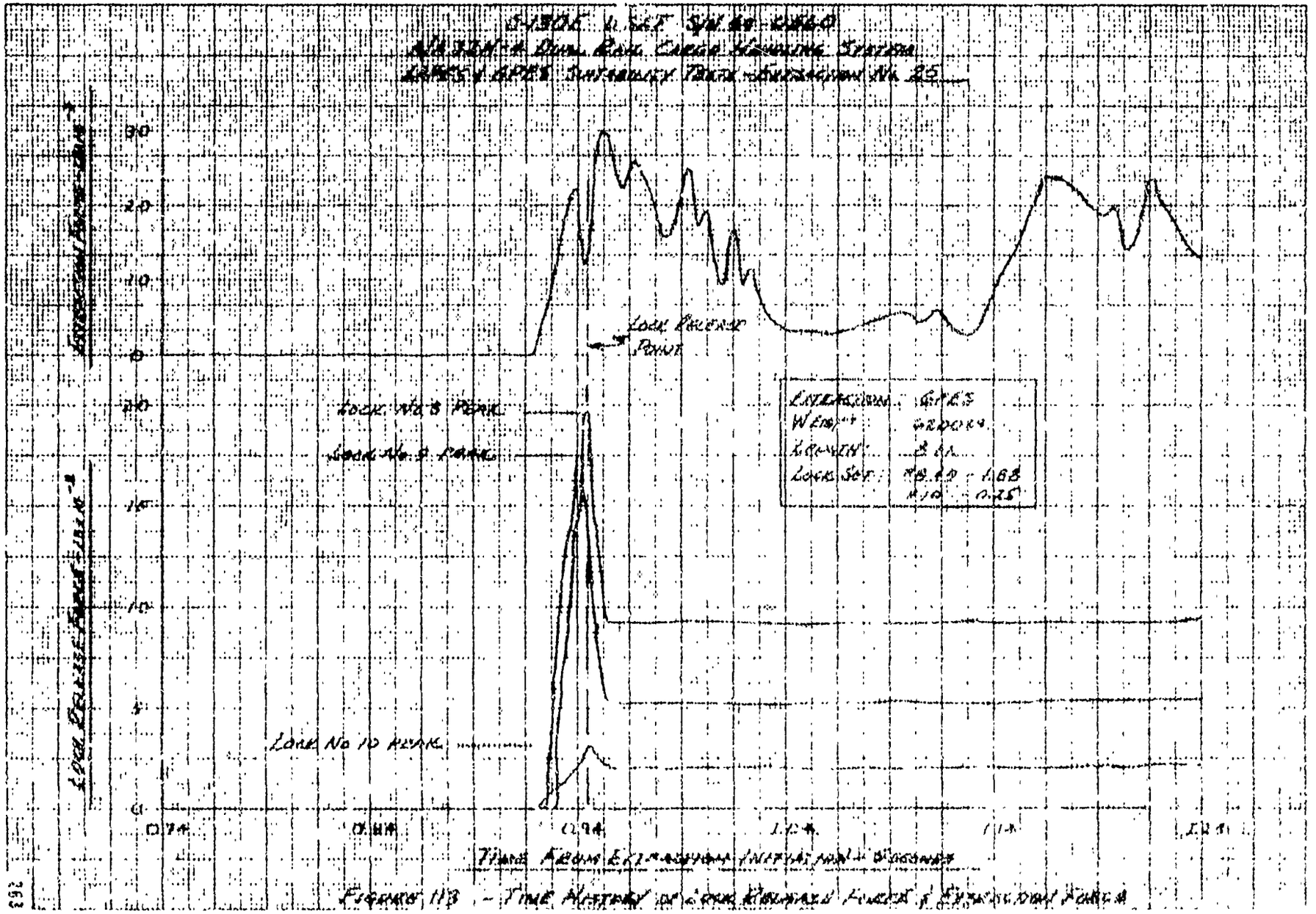


Figure 113 - Time History of Local Pressure Levels & Pressure Power

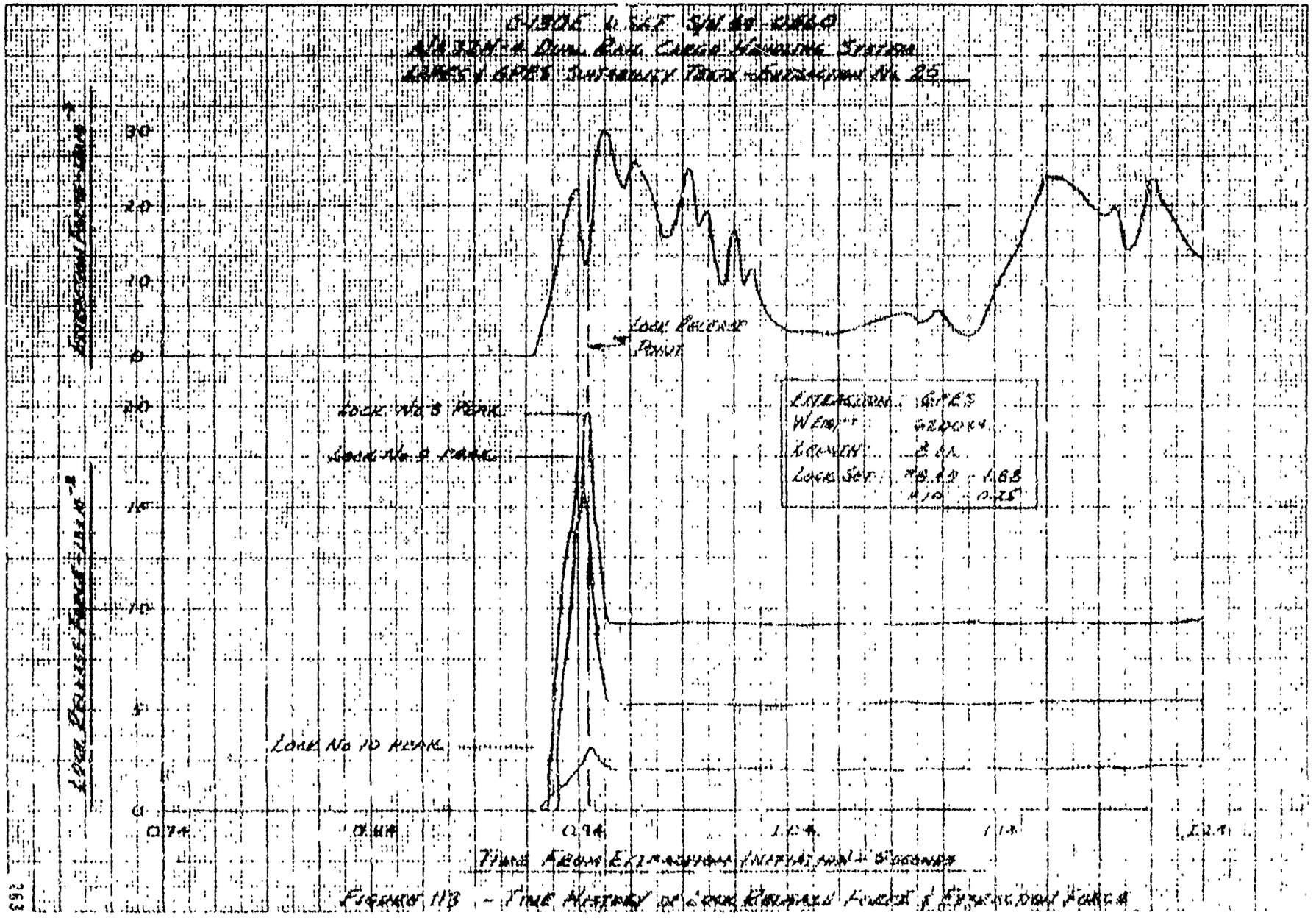


FIGURE 113 - TIME HISTORY OF LOCK CHAMBER LOCAL EXCESS PORE

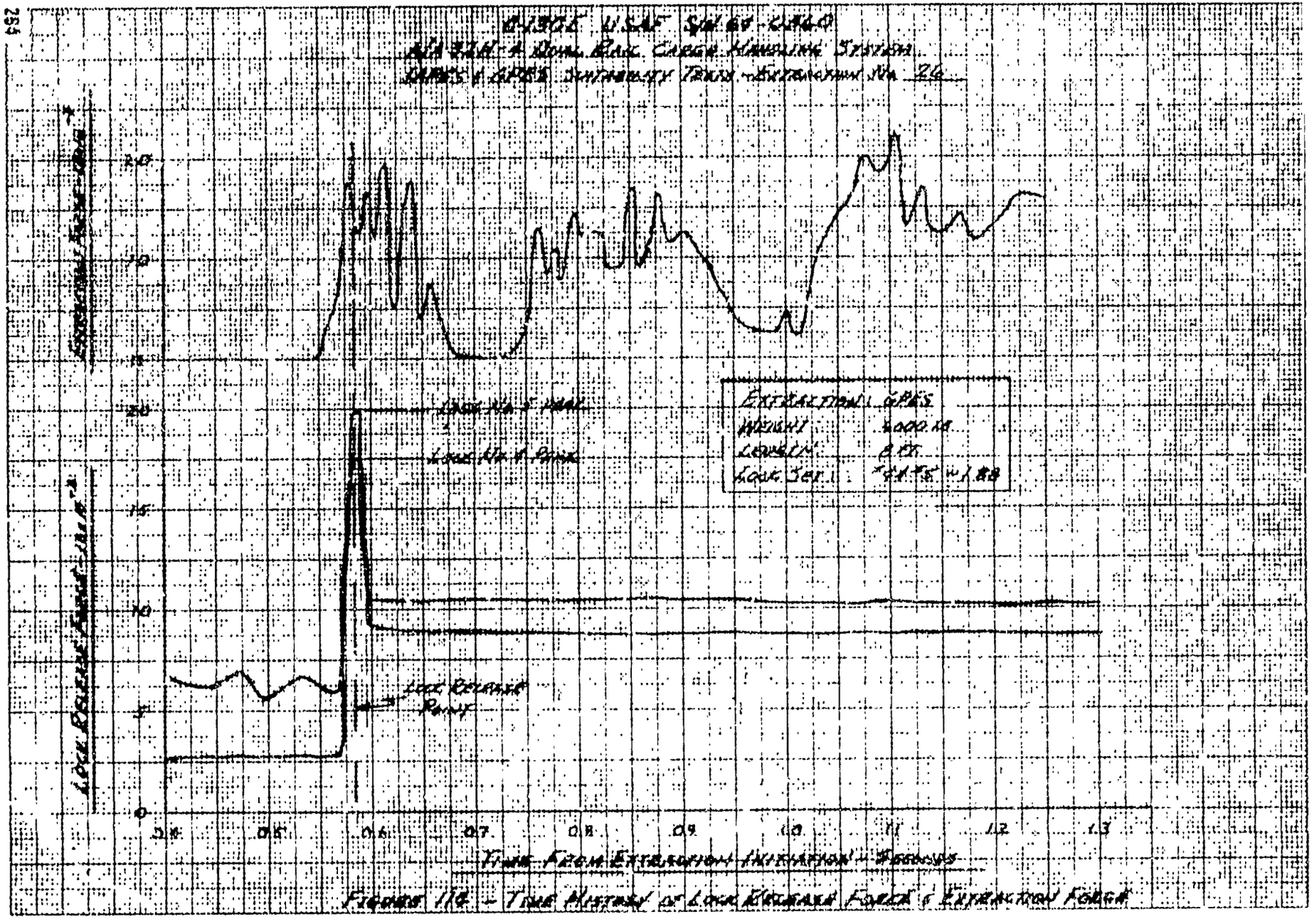
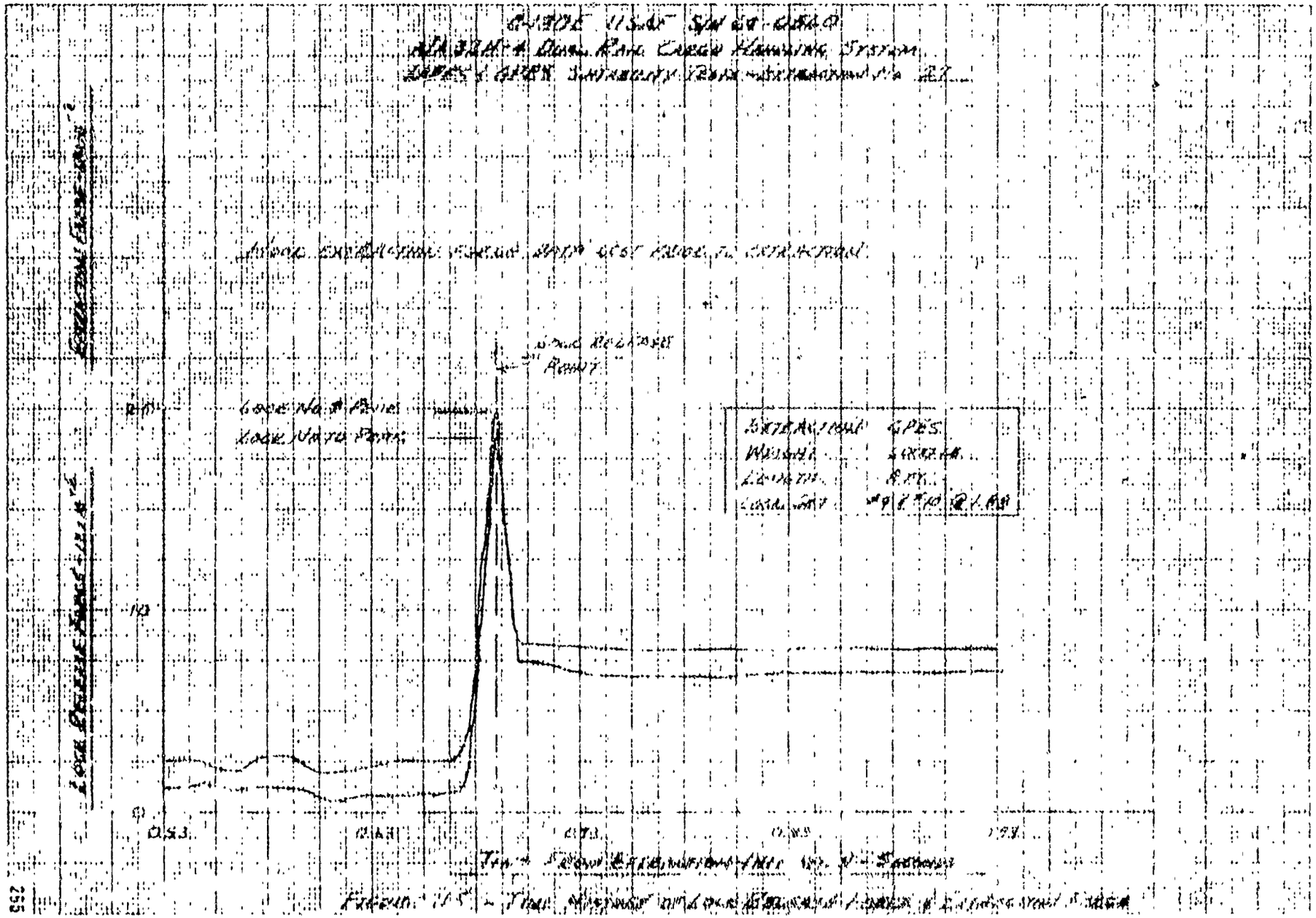


Figure 11c – Time History of Load Release Force & Extraction Force



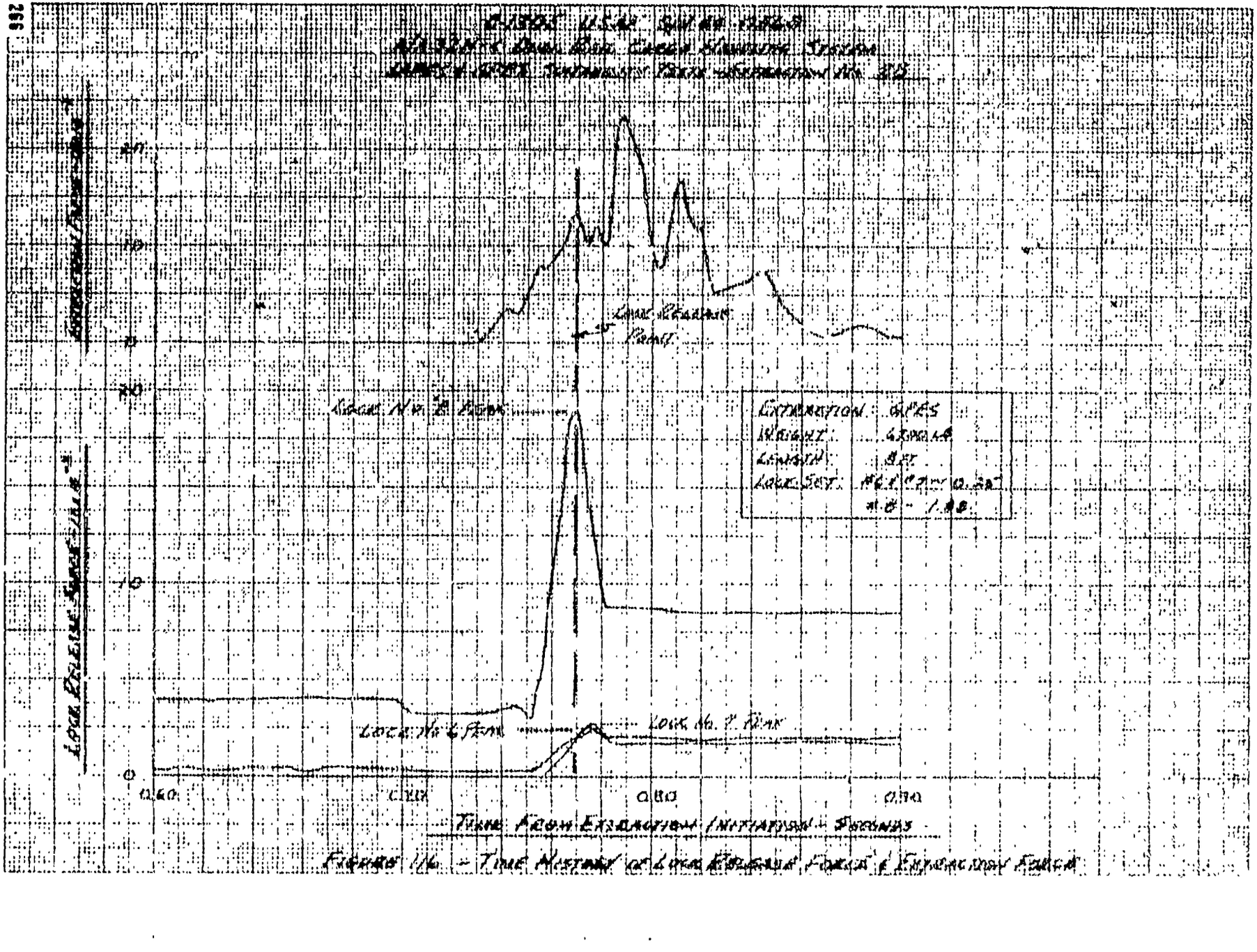


Figure 1/6 – Time Mean of Long Excursion Index Excursion Areas

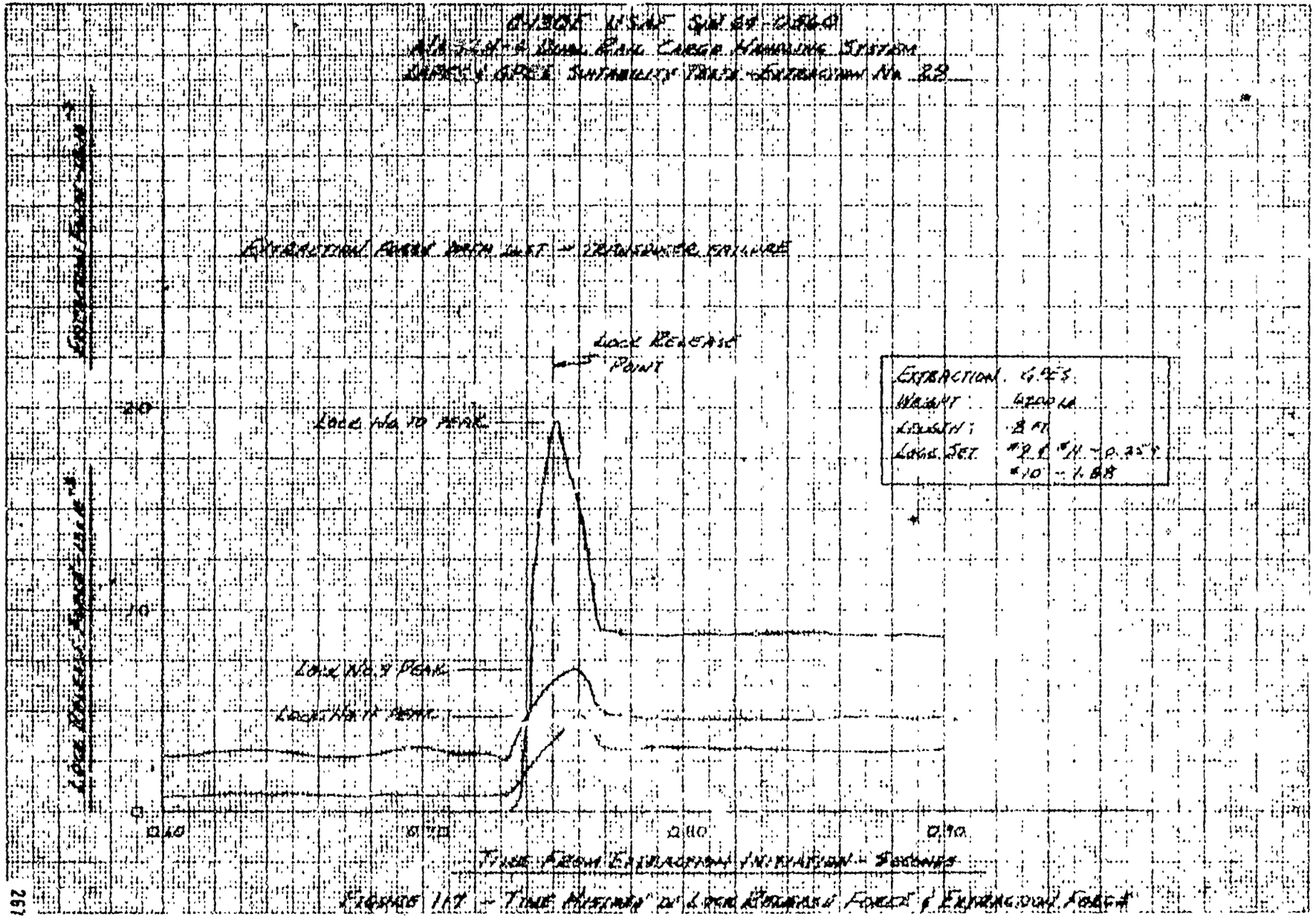


Figure 117 - Time History of Load Attenuator Force & Extraction Force

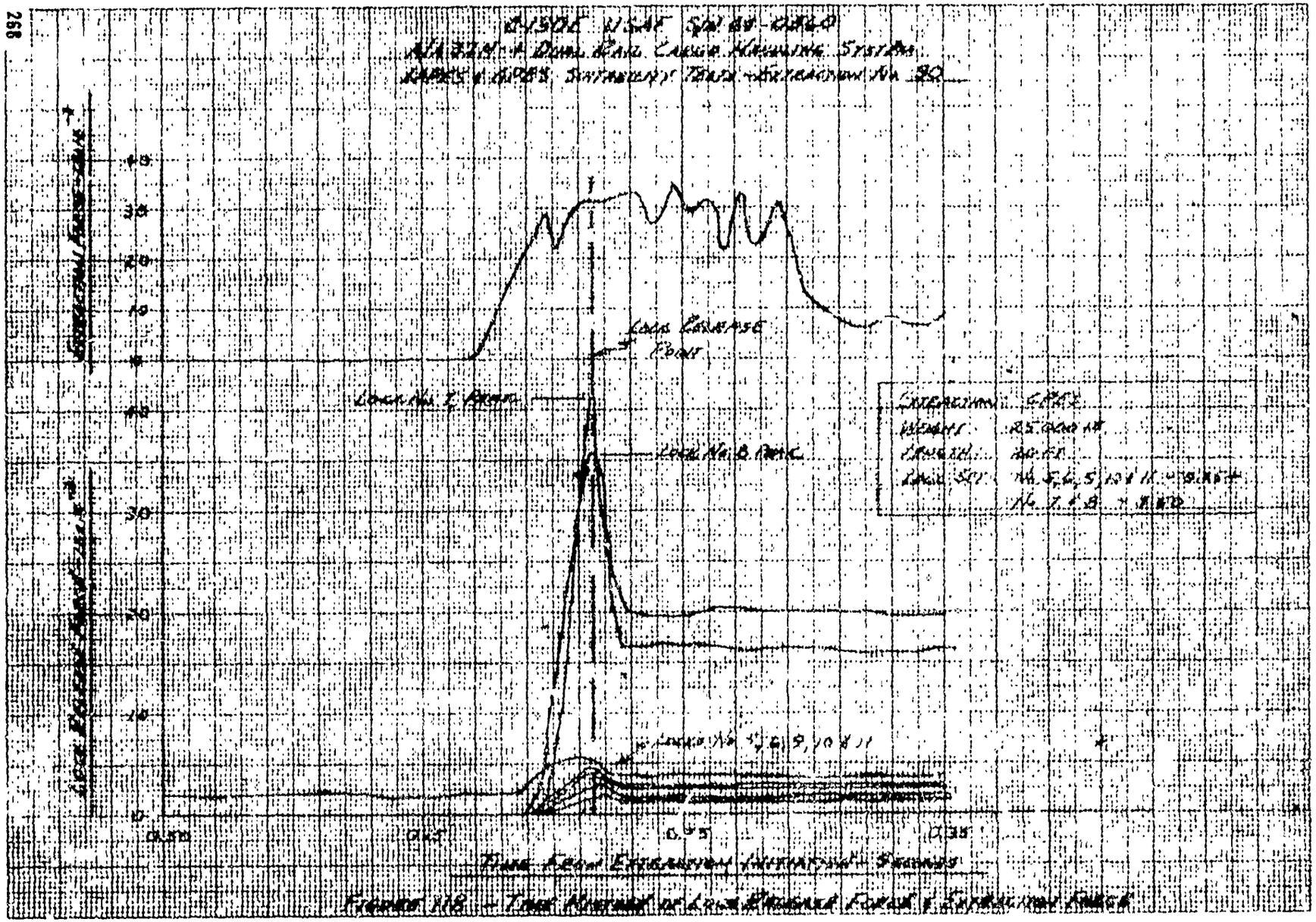
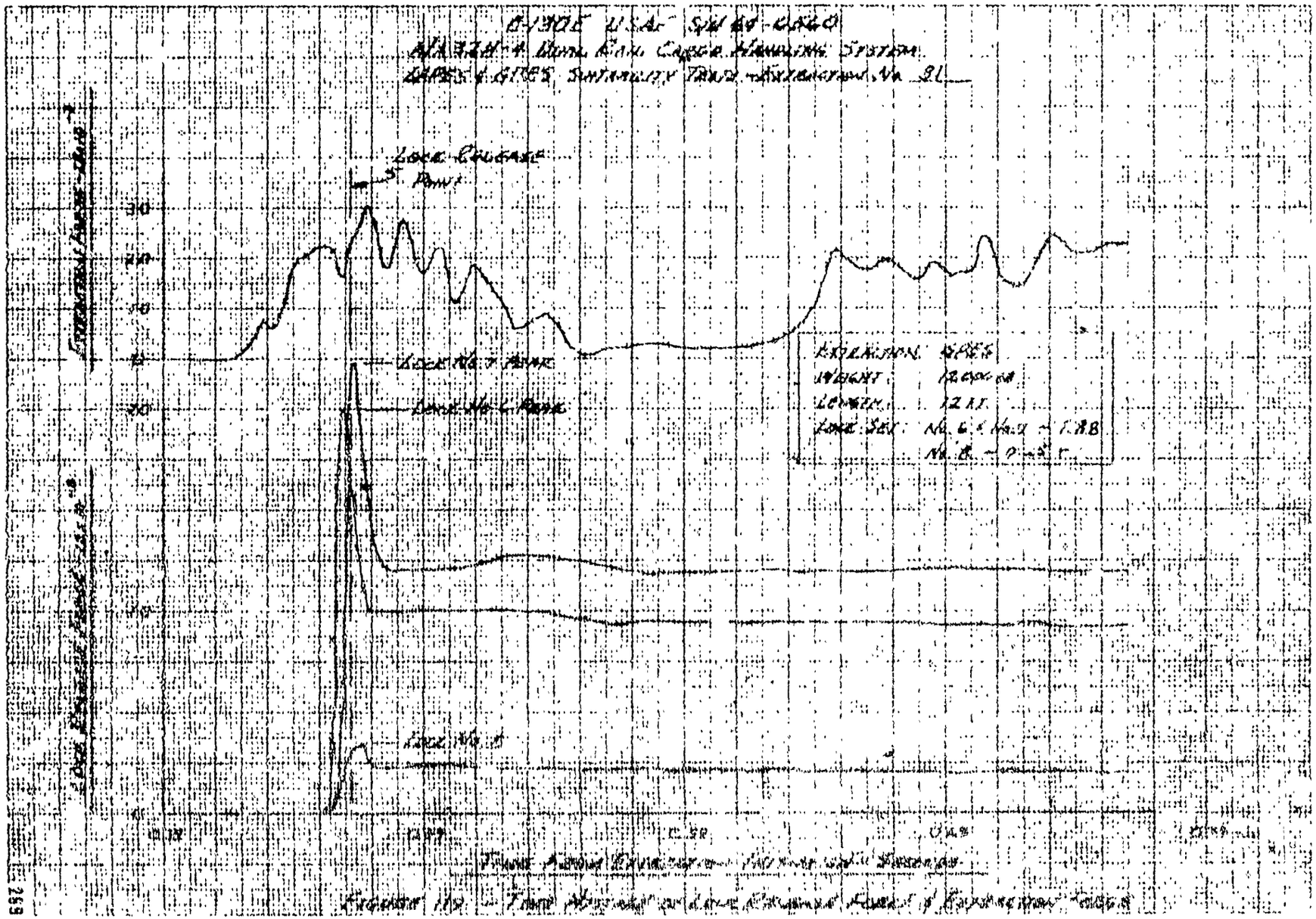
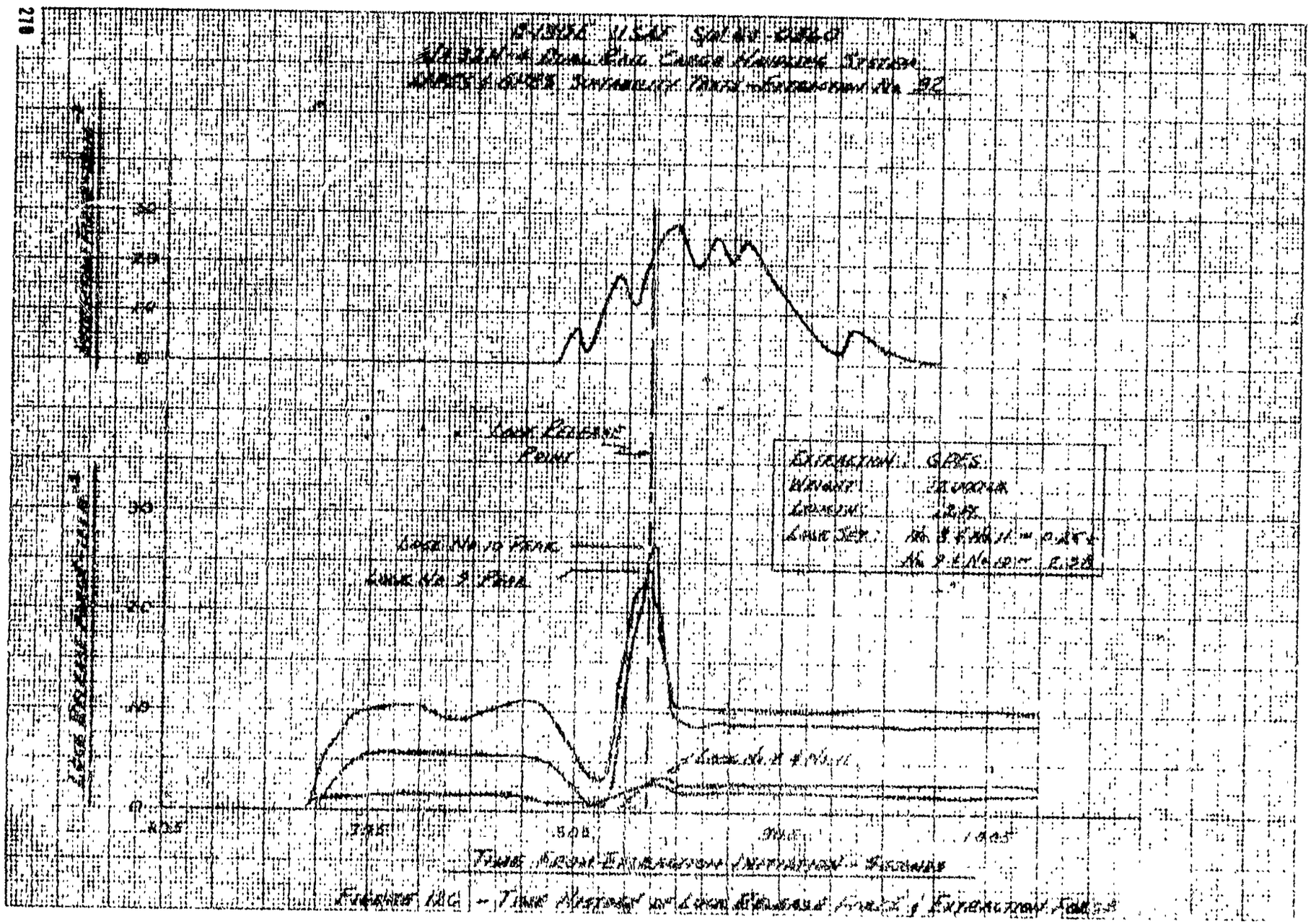


Figure 118 — Time Alignment of a Multiple Focal Earthquake





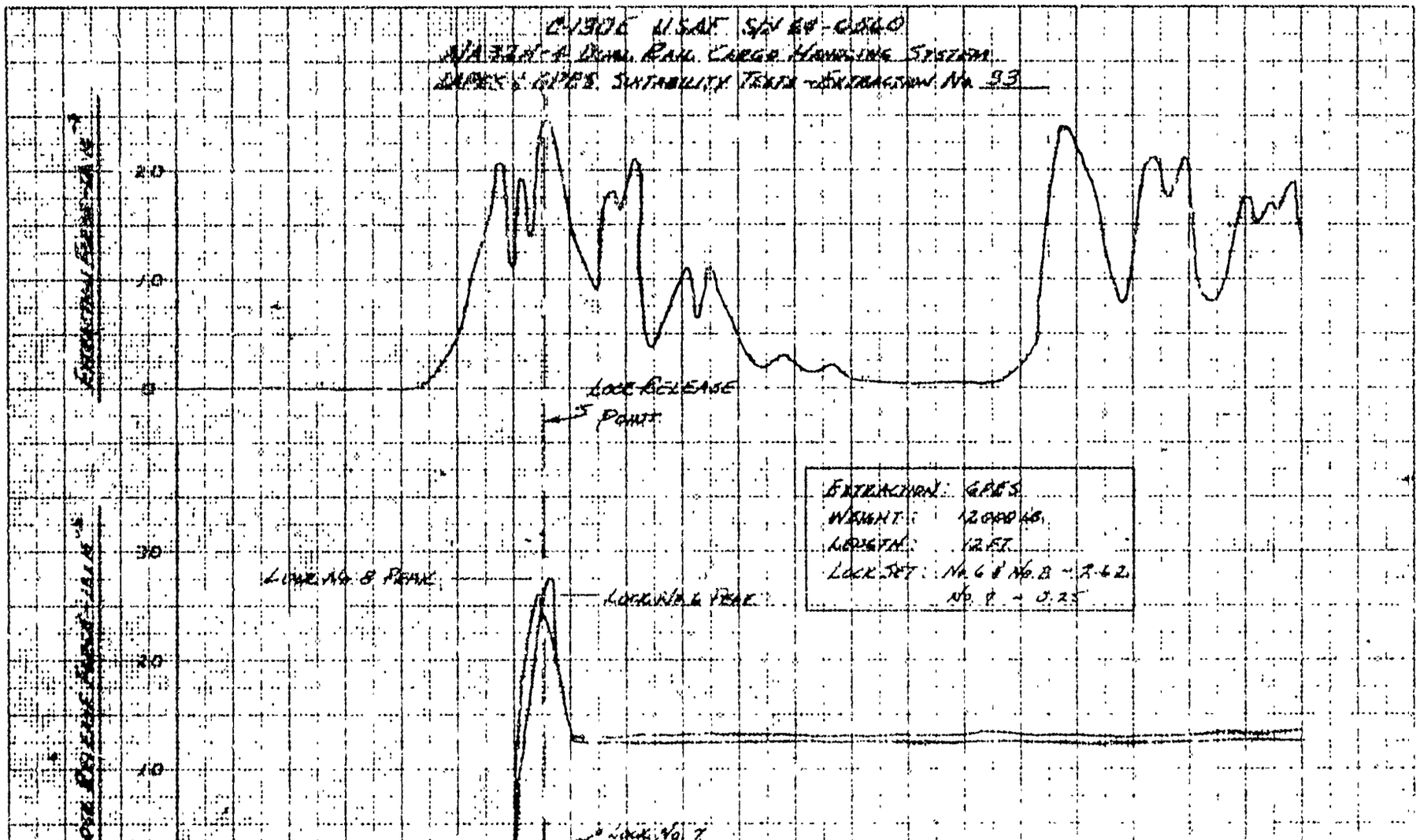


FIGURE 121 - TIME HISTORY OF SUCK RELEASE FORCE & EXTRACTION FORCE

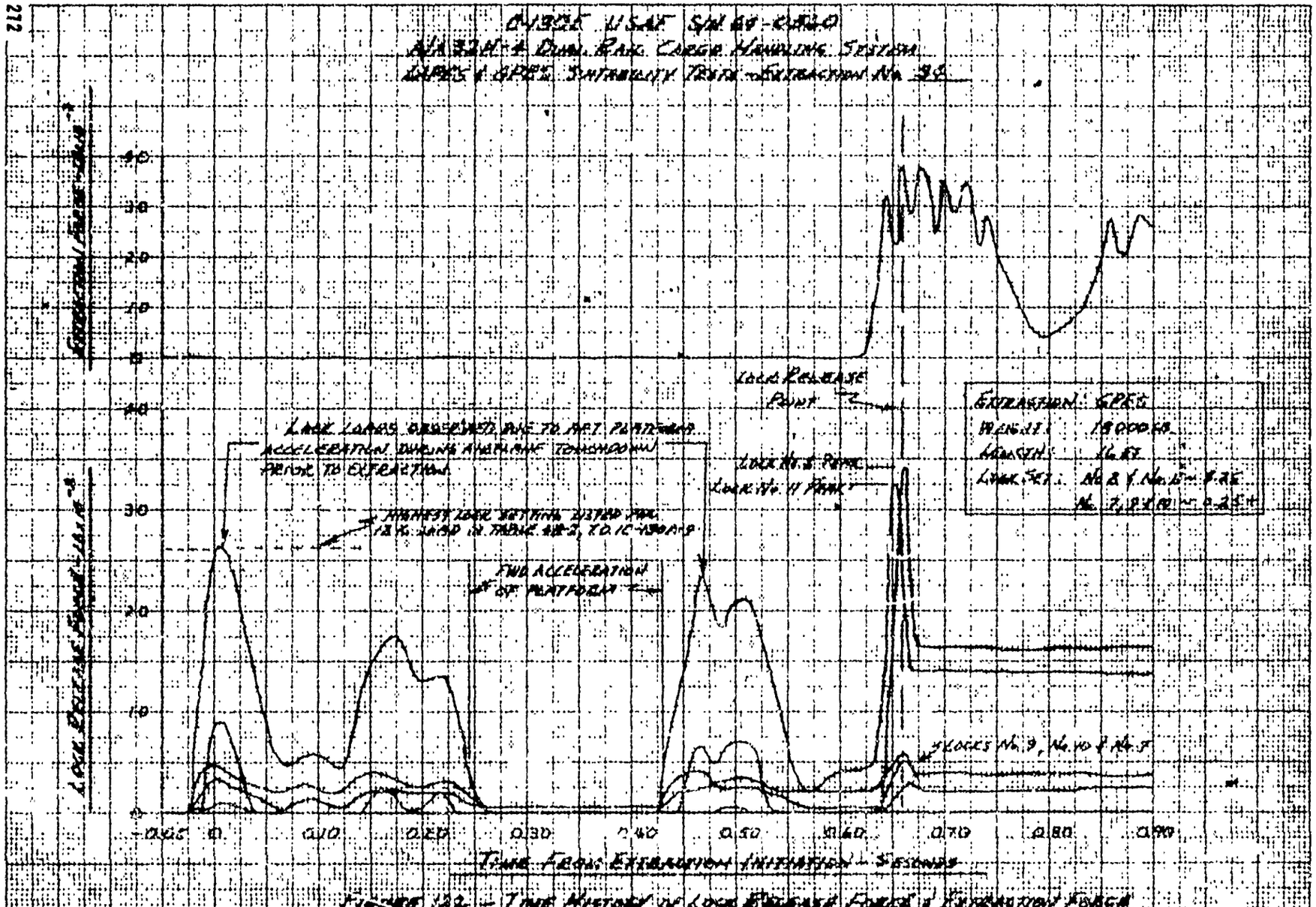


Figure 122. - Time History of Load Dynamic Factor & Extraction Force

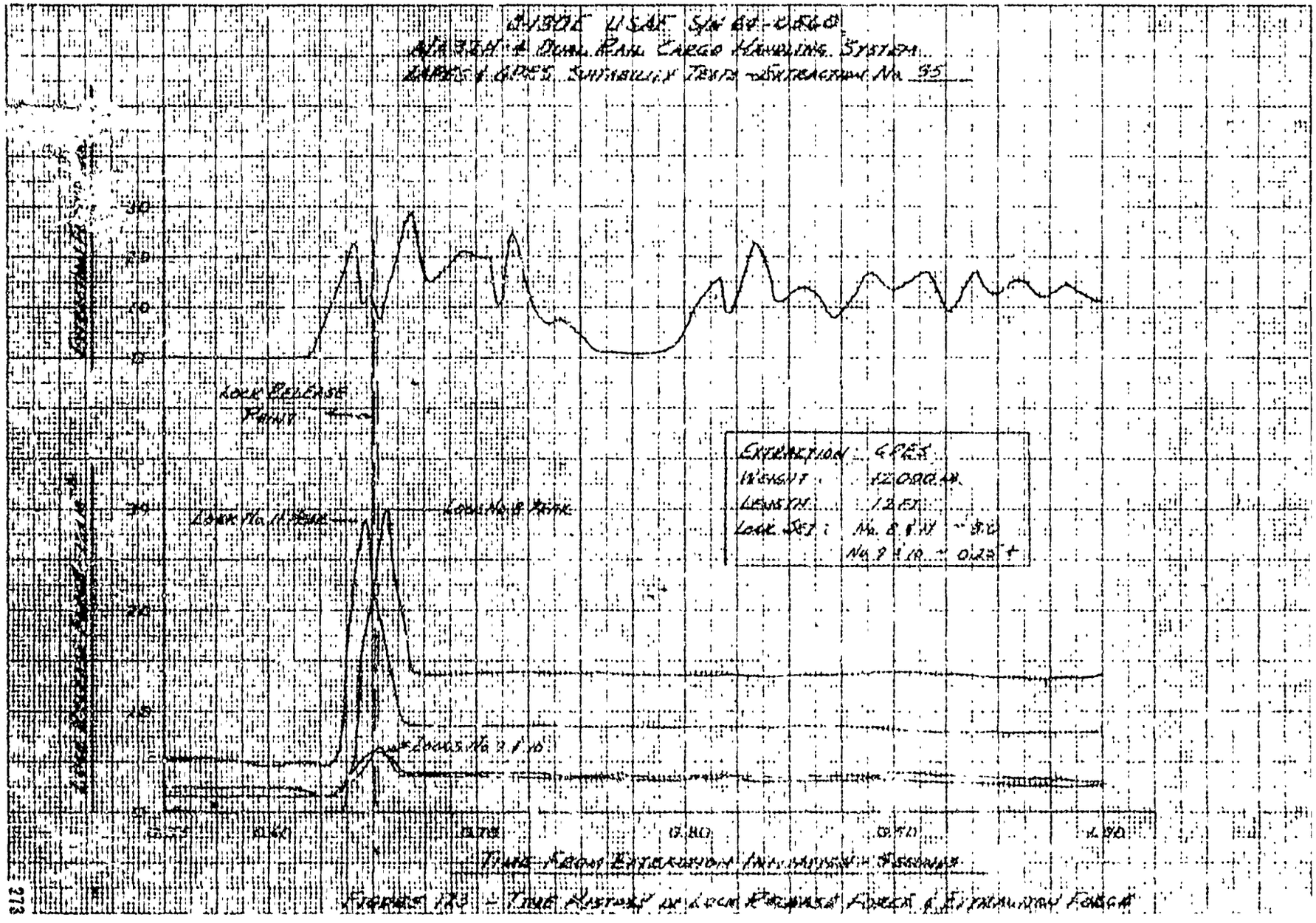


Figure 123 – Time History of Load Release and Extraction Forces

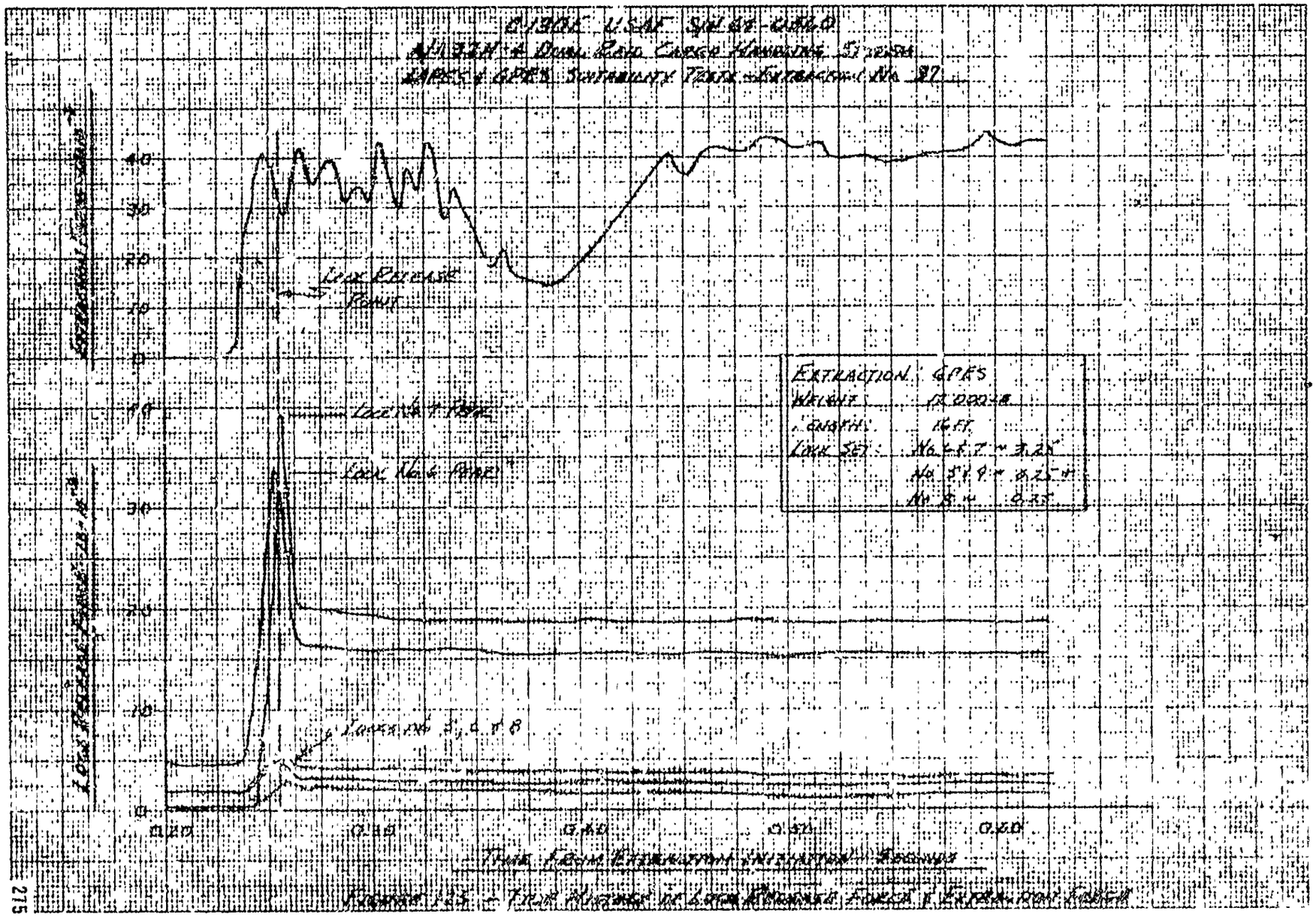
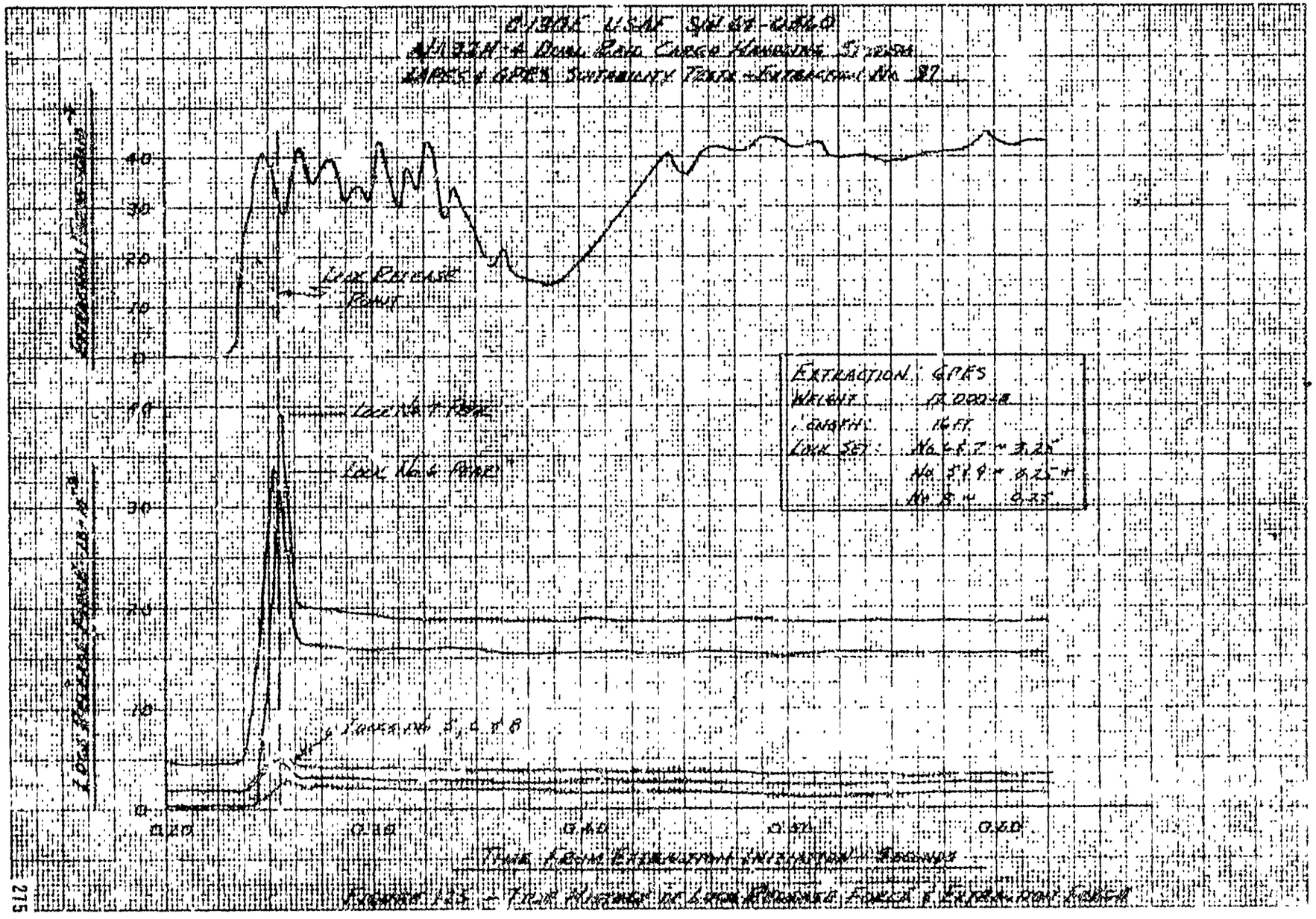
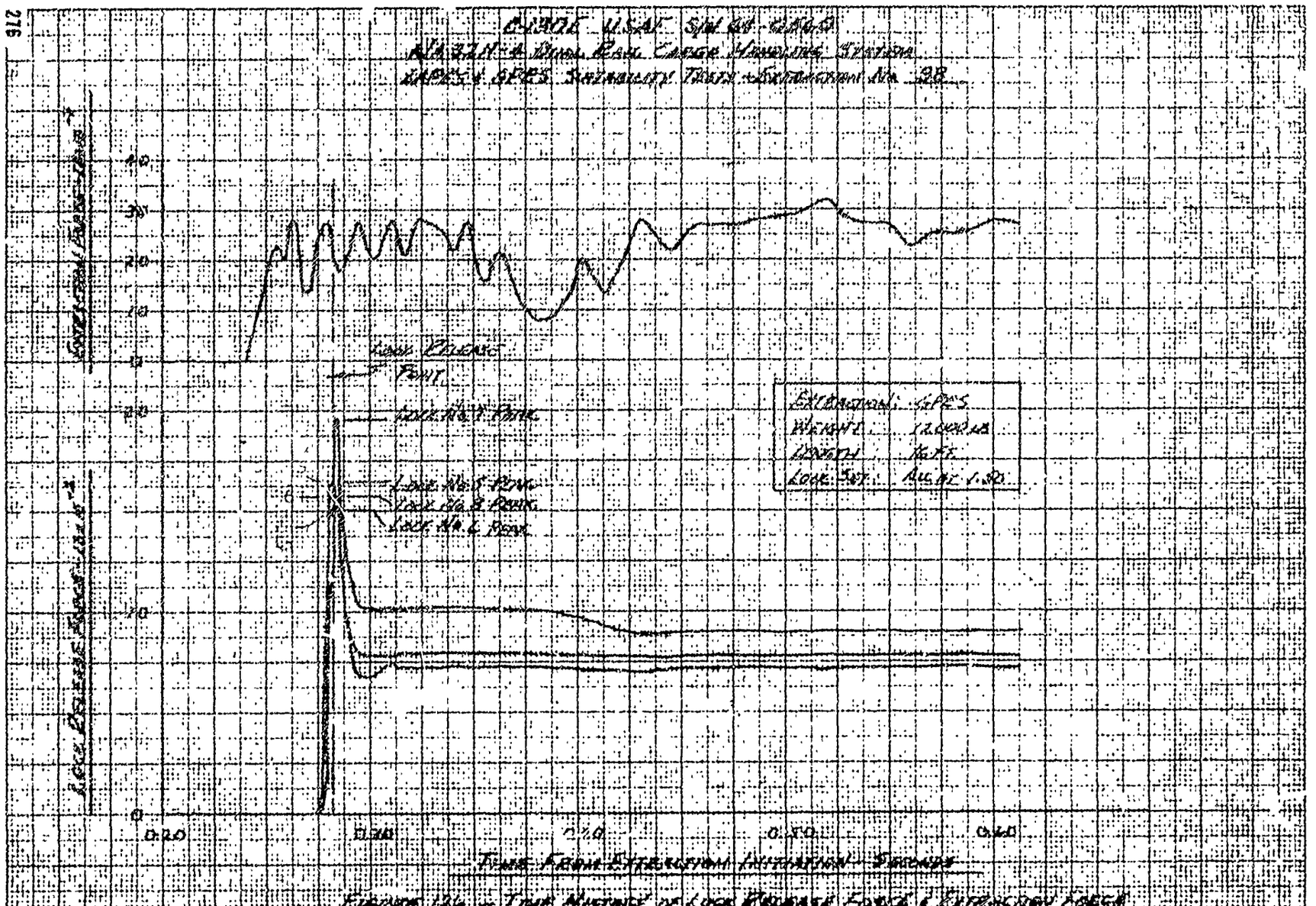
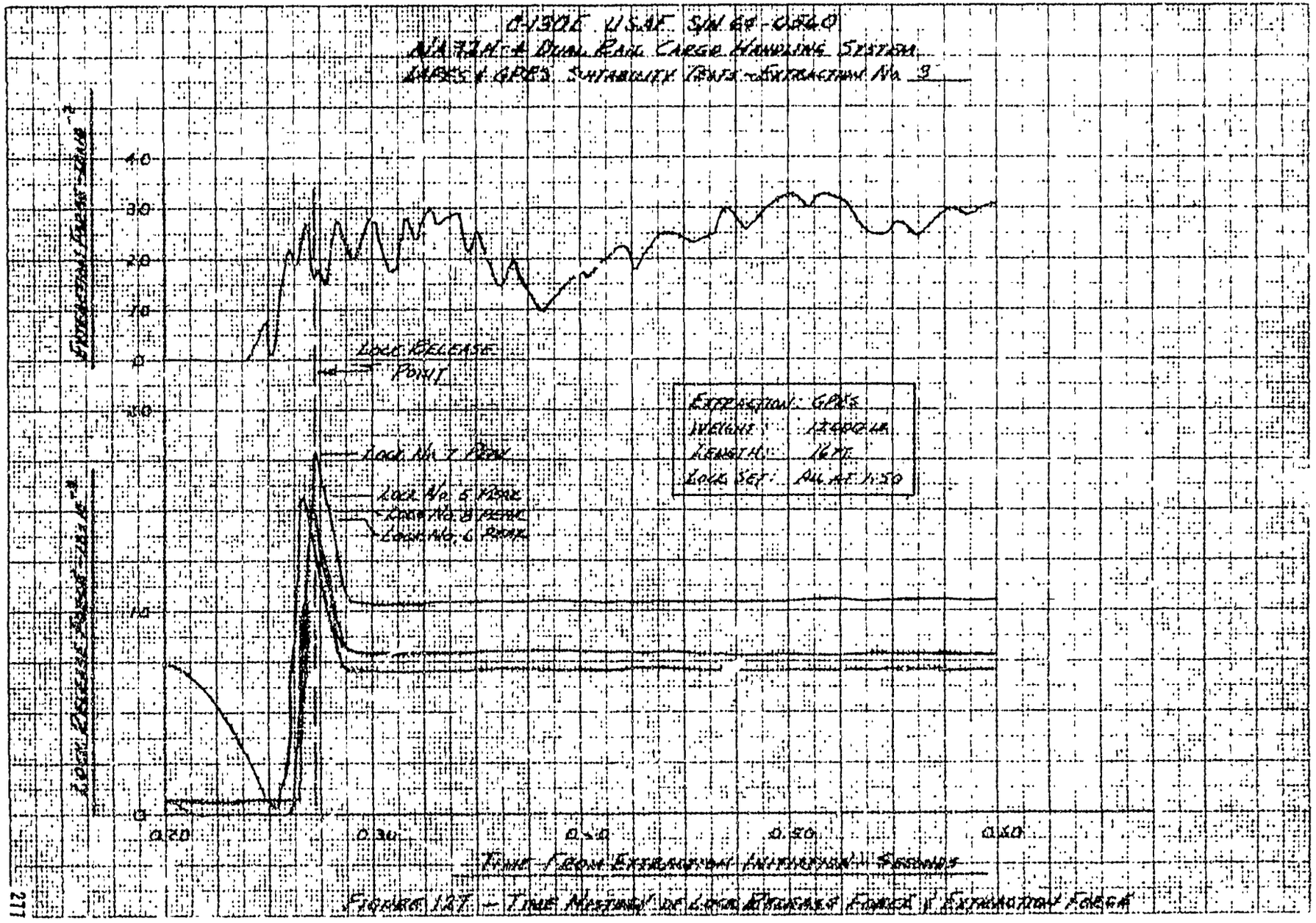


Figure 125 - Flow Pressure Relationship During Extraction


Low Pressure Point
Low Pressure Point
Low Pressure Point
EXTRACTION GPES
Low Set:
No 5 = 0.35"


Extension, GPES
Weight 120 kg
Length Kafe
Load Set Right 1.80
Time From Application of Force
Time History of Load Applied and Extension Noted


C-130E USAF SN 64-0560
Military Dual Rail Cargo Handling System
Drop of GRES Swinging Load - Extraction No 3
Load Release Point
Extraction GRES
Weight 42000 LB
Length 16 FT
Load Set Aft at 1.50
Load No 7 Rear
Load No 6 Rear
Load No 5 Rear
Load No 4 Rear
Time from Extraction Initiation - Seconds
Figure 127 - Time History of Load Attitude Force and Extraction Force

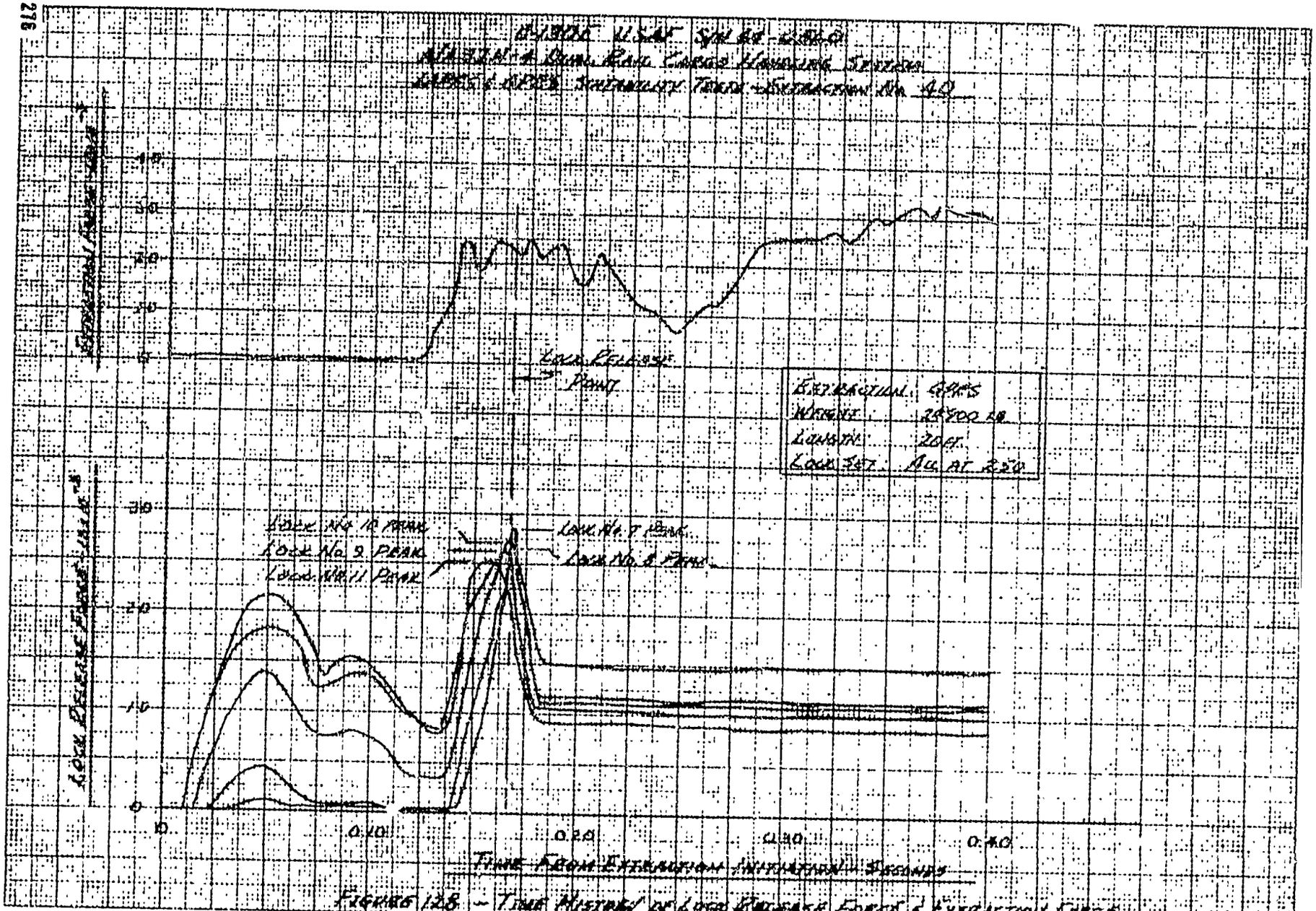


FIGURE 128 – TIME HISTORY OF LOCAL ENERGY FLUXES FOLLOWING EXTRACTION ABORT

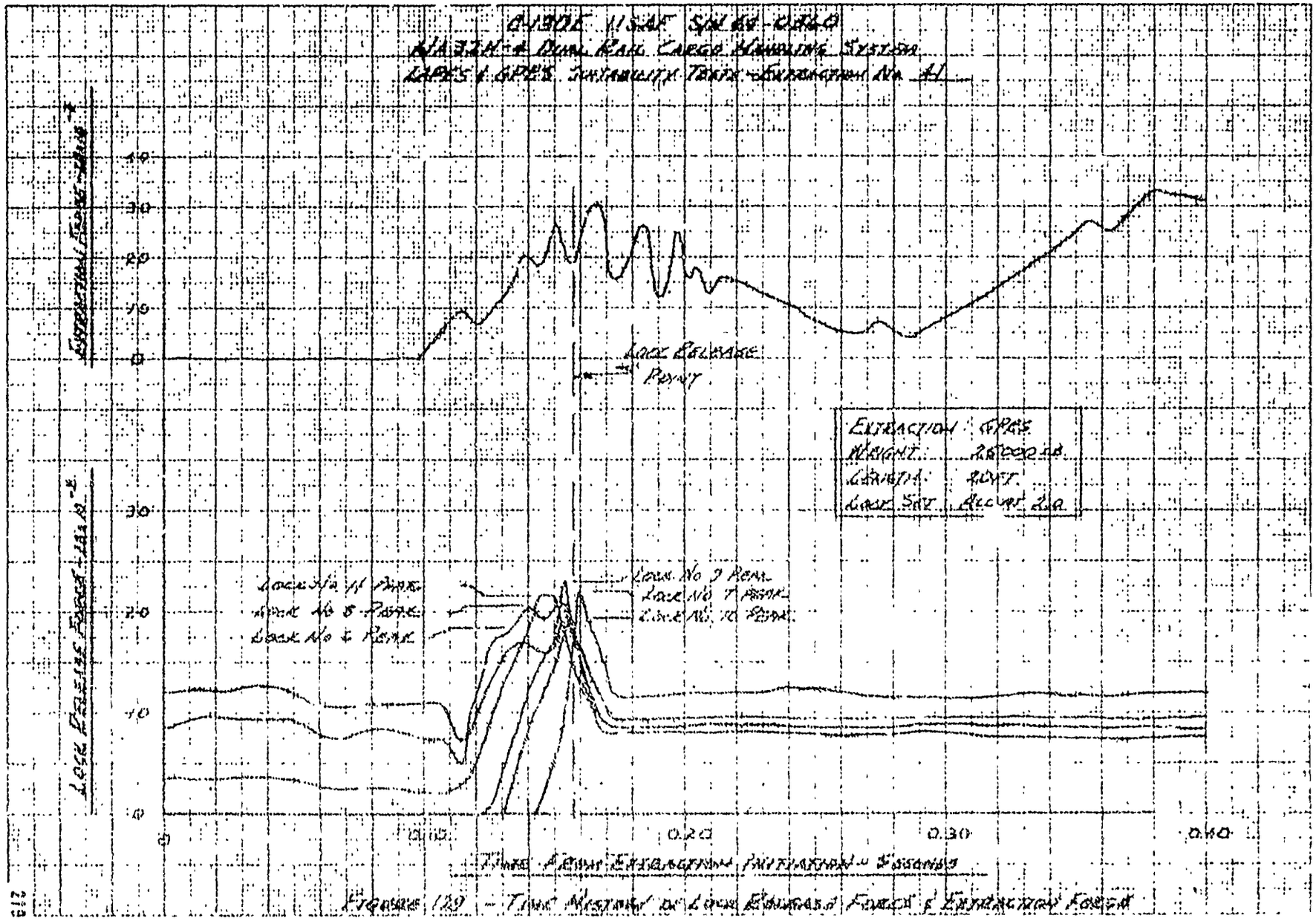


Figure 129 - Time History of Load Release, Pitch & Extraction Forces

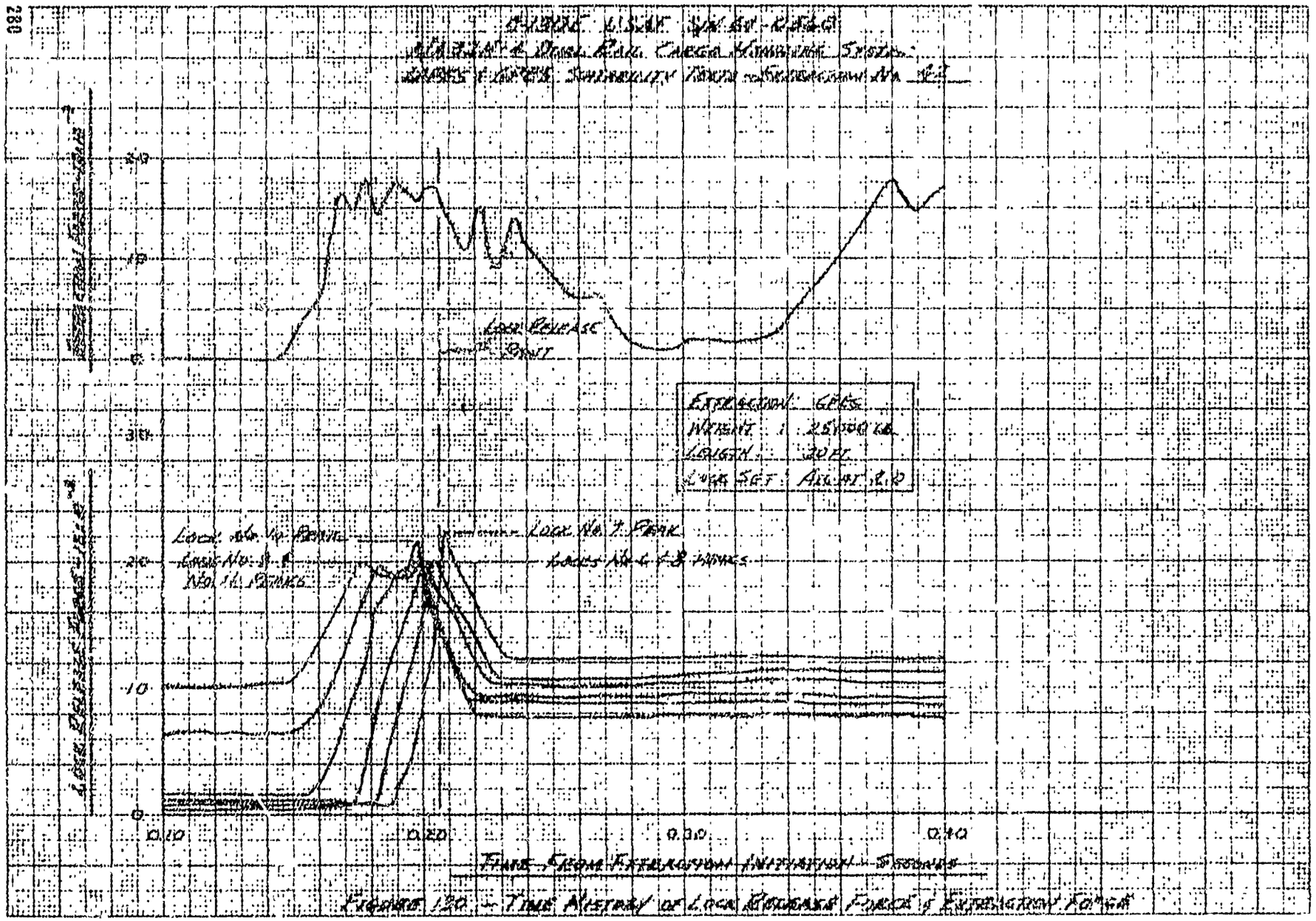


Figure 120 - Time History of Lock Forces During Extraction Force

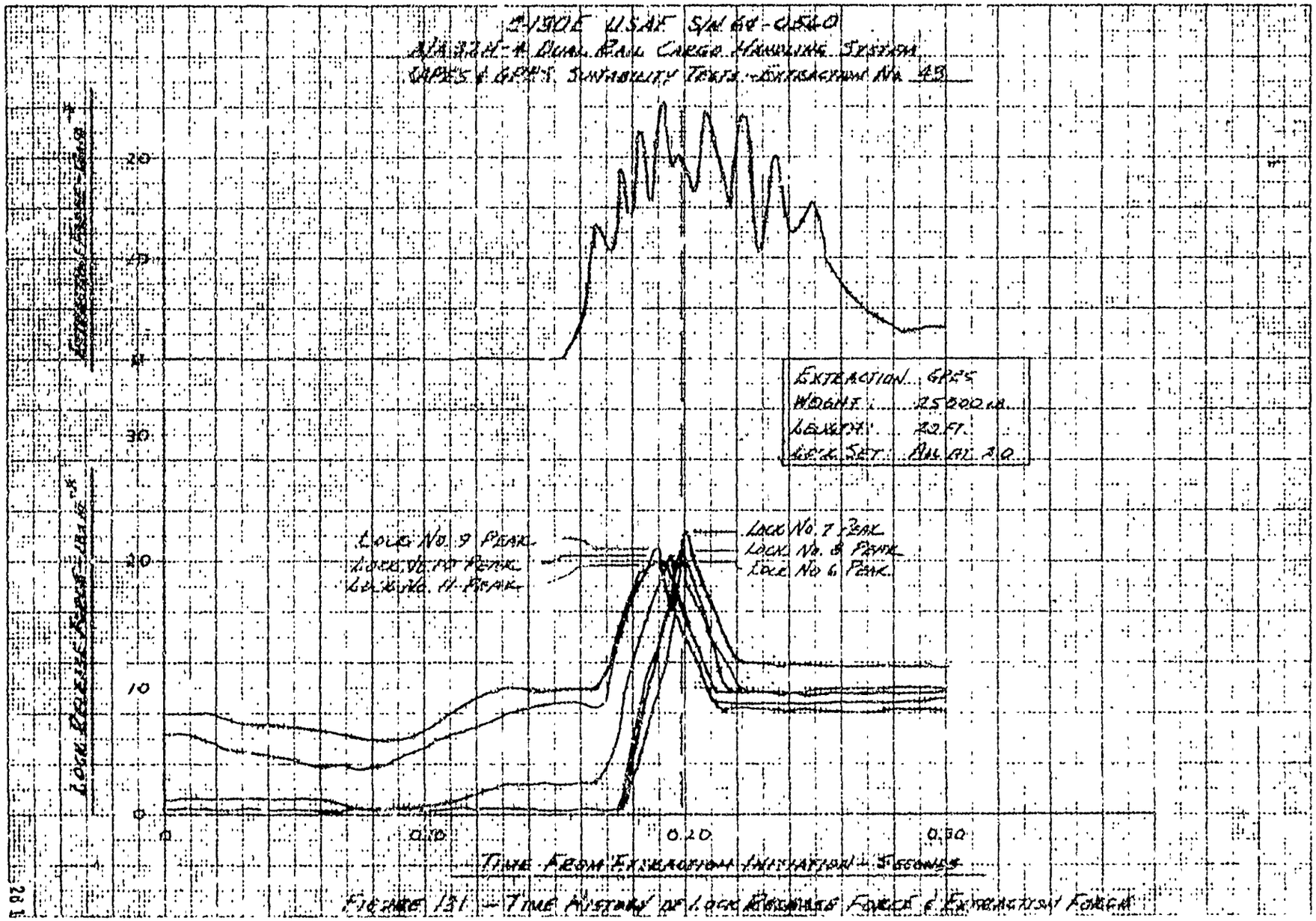


Figure 131 - Time History of Lock Reaction Force & Extraction Force

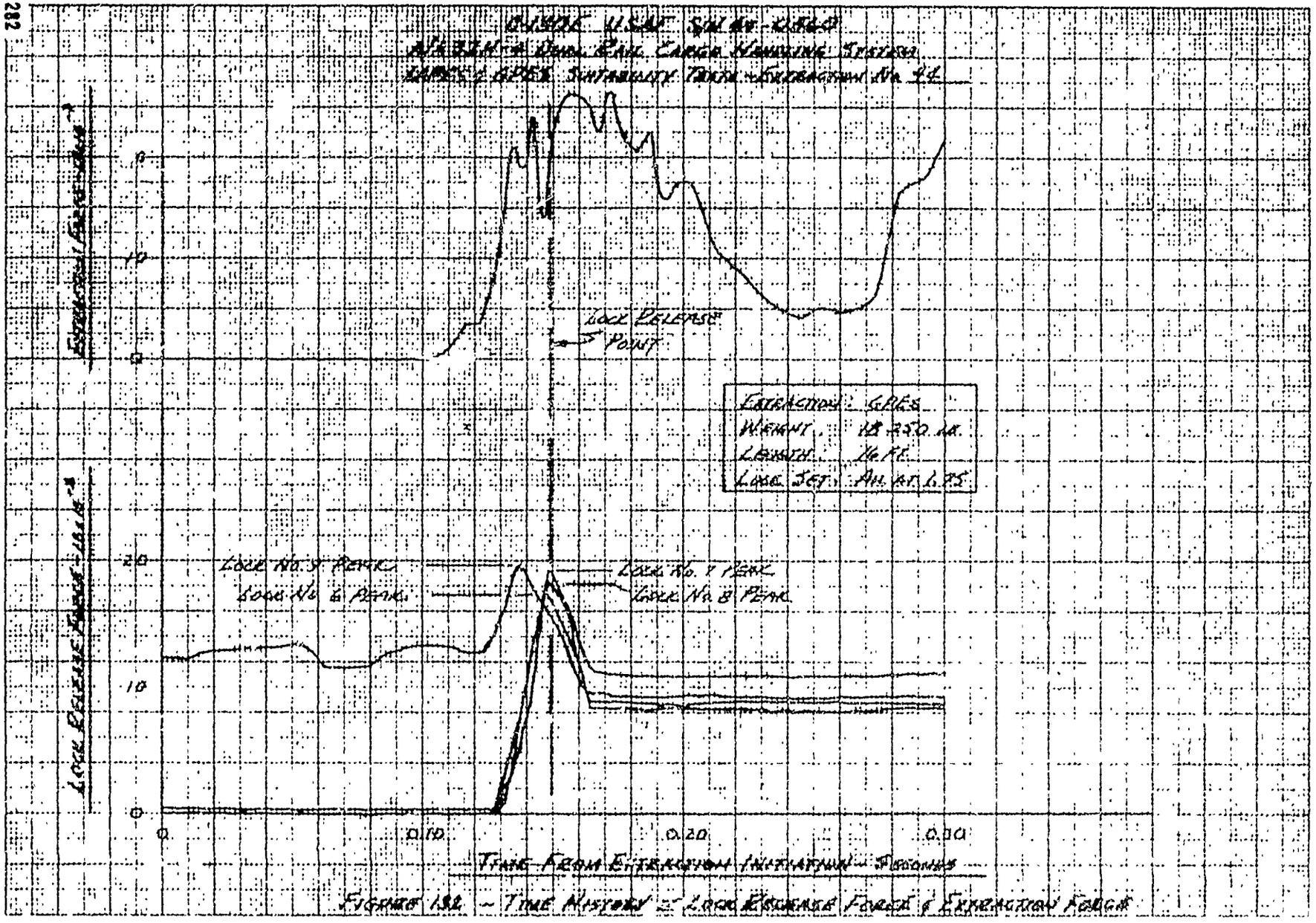


Figure 182 - Time History of Lock Release Force & Ejection Force

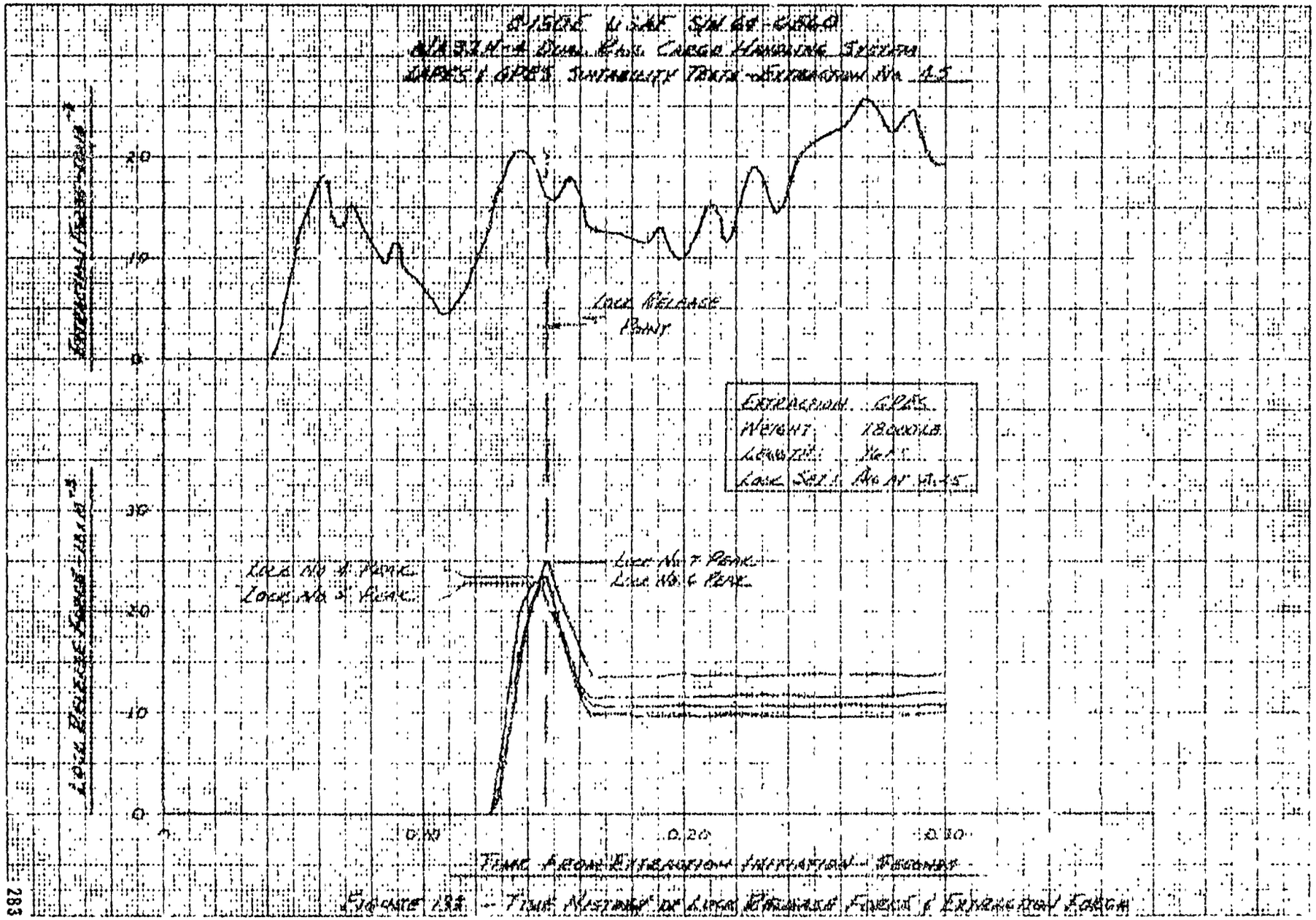


FIGURE 134 - TIME HISTORY OF LOCK FORCES FROM EXTRACTION FORCE

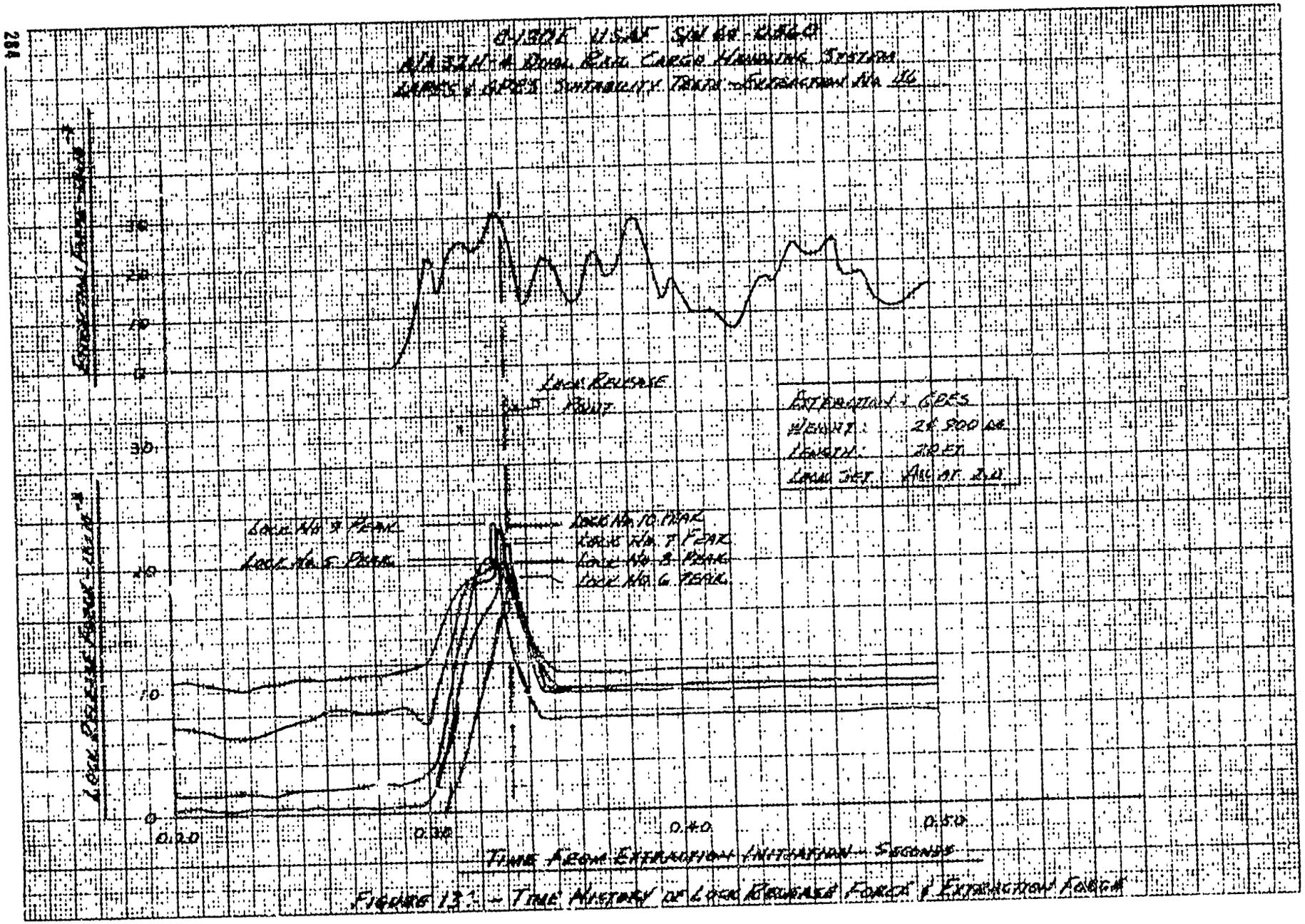


FIGURE 13 - TIME HISTORY OF LOCAL RELEASE FORCE & EXTRACTION FORCE

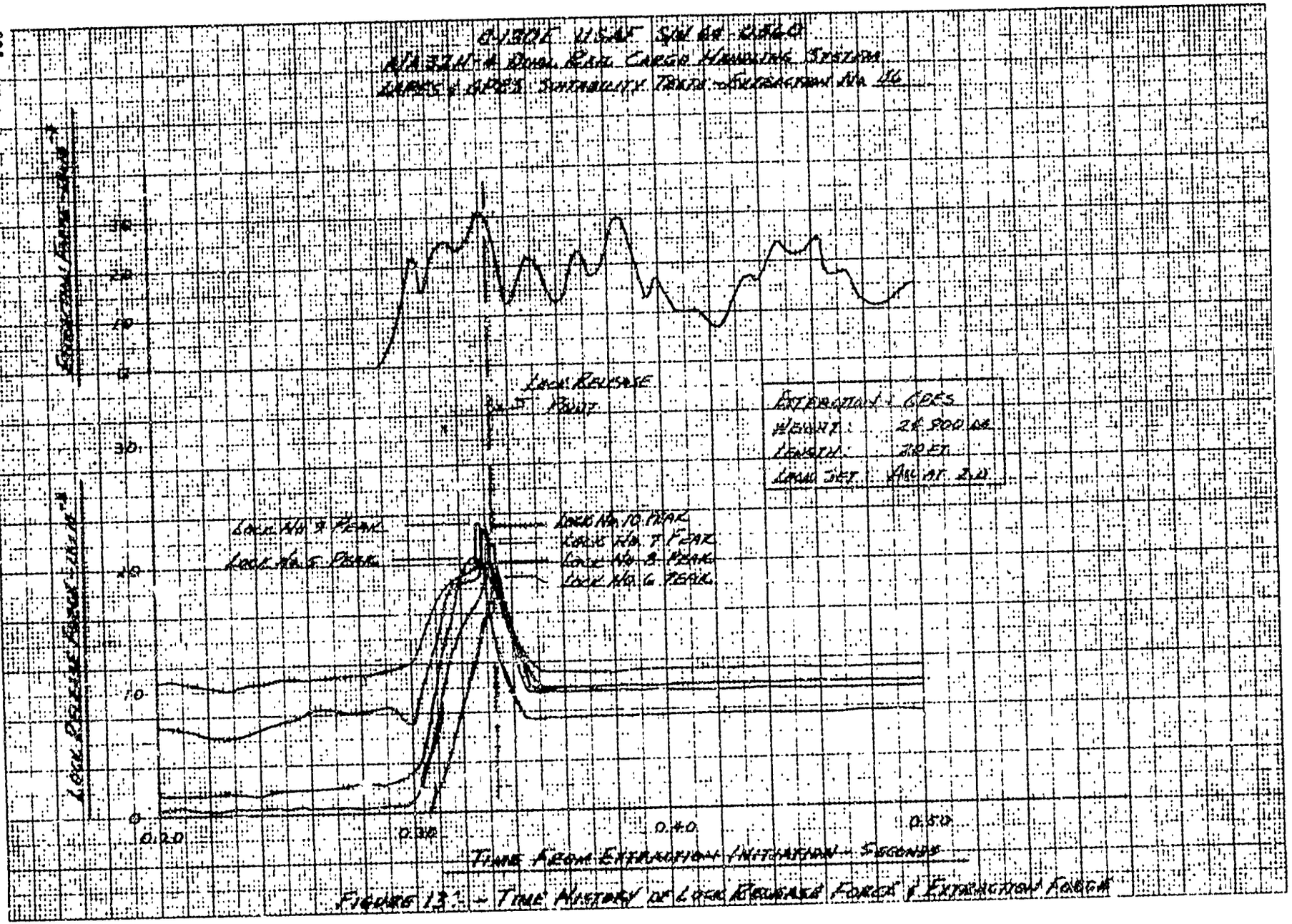


FIGURE 13 - TIME HISTORY OF LOCAL RELEASE FORCE & EXTRACTION FORCE

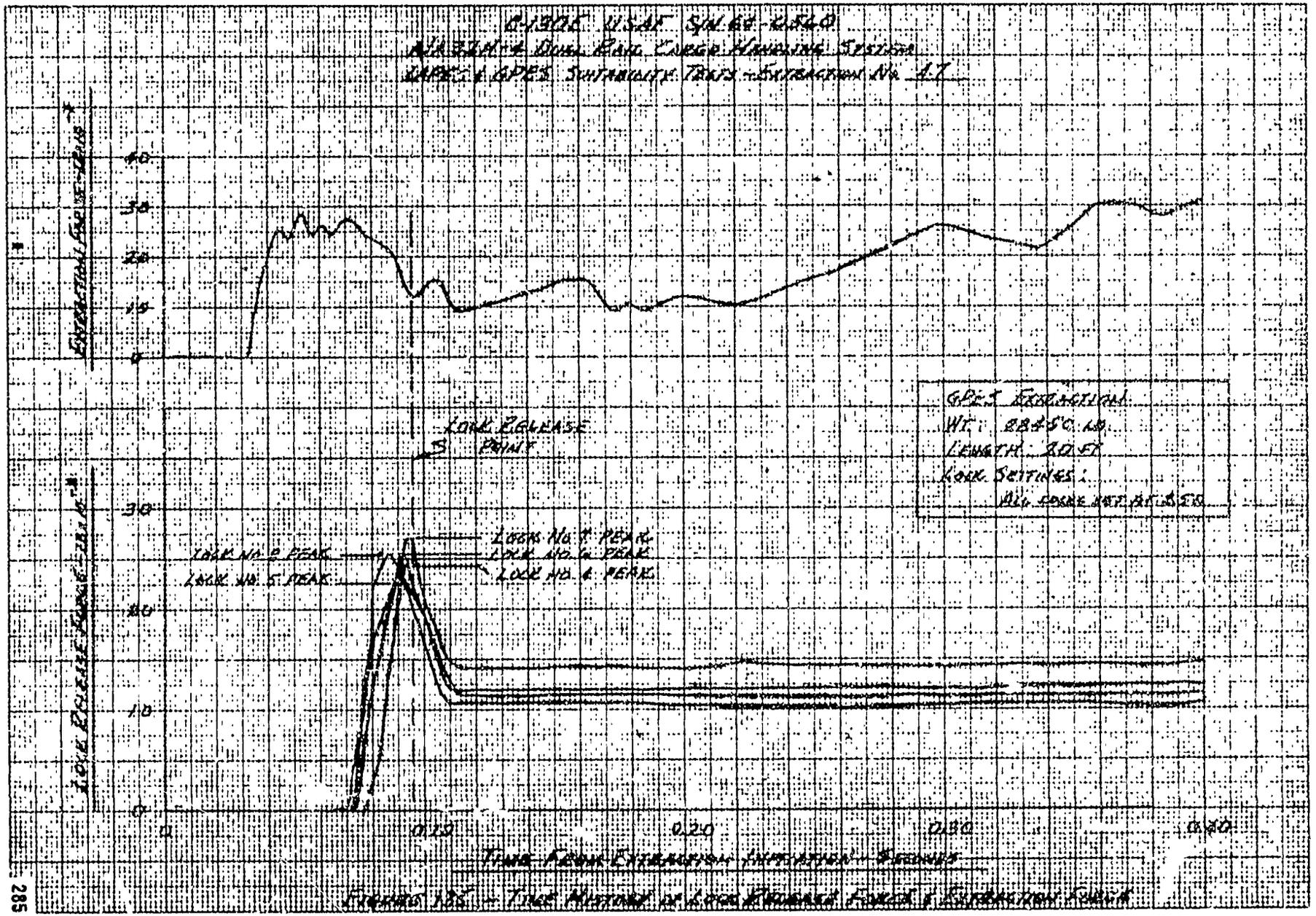
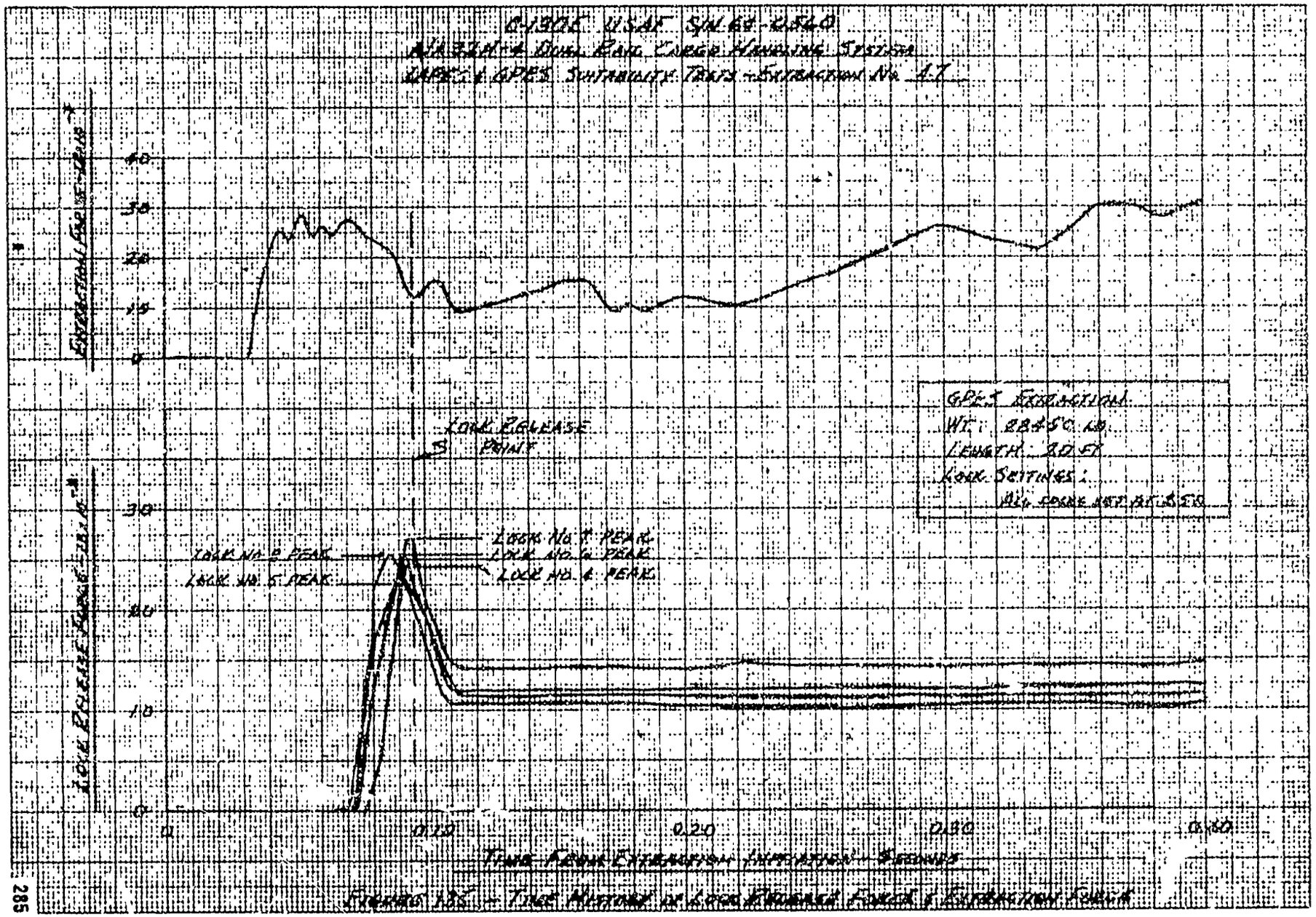


Figure 125 - Time History of Lock Release Force & Coupler Force


GPES USAF SN 65-6540
Airborne Dual Ring Cargo Handling System
GPES Extraction Parameters
GPES Extraction
Wt.: 2845 Lb
Length: 30 Ft
Lock Settings:
Lock Release Point
Lock No. 1 Peak
Lock No. 2 Peak
Lock No. 3 Peak
Lock No. 4 Peak
Lock No. 5 Peak
Lock No. 6 Peak
Extraction Force - Lbs
Lock Release Force - Lbs
0.20
0.40
Time After Extraction Impulse - Seconds
Figure 125 - Time History of Lock Release Force & Extraction Force

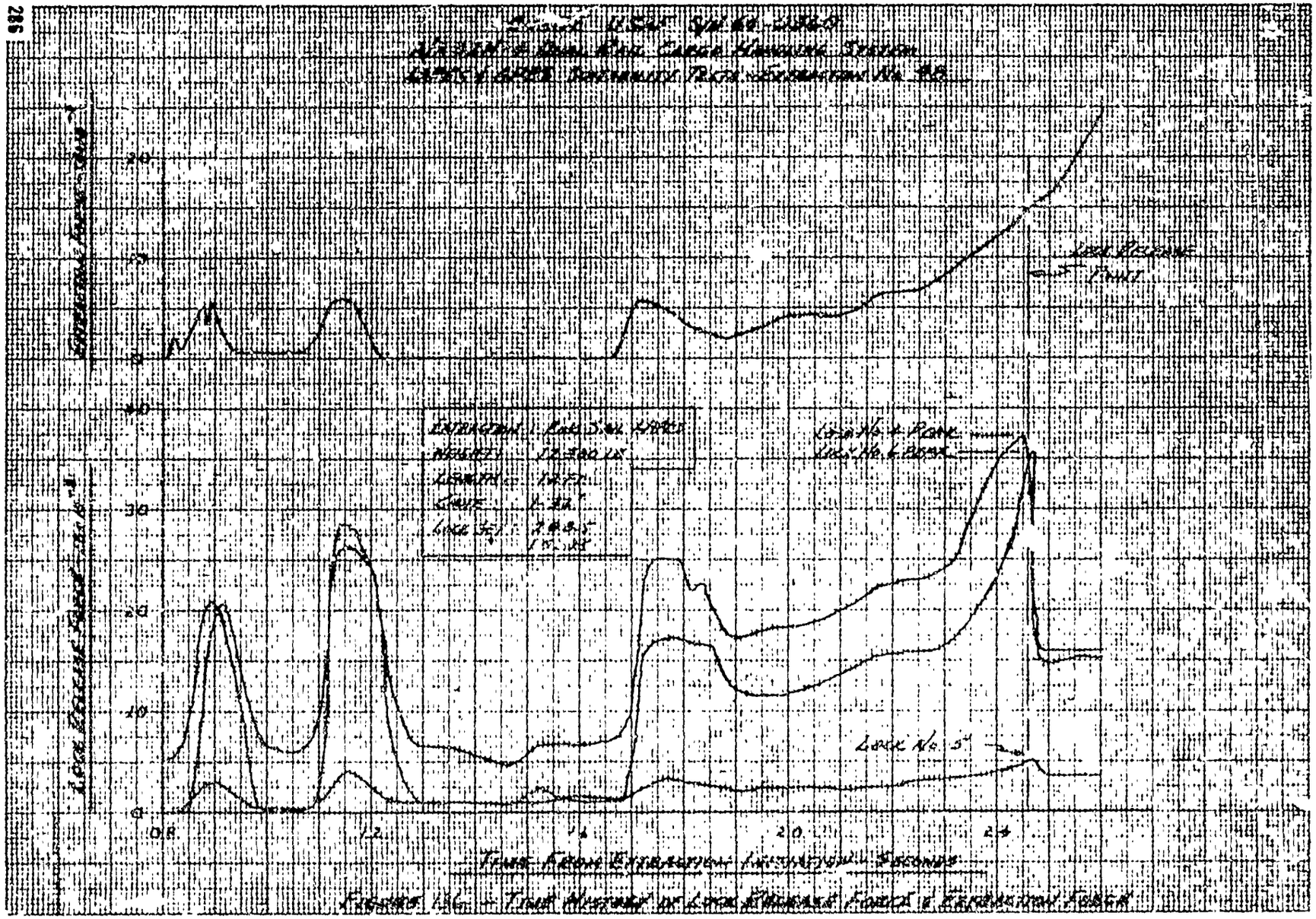


Figure 116. — Time Records of Gage Elevated Points of Explosion Area

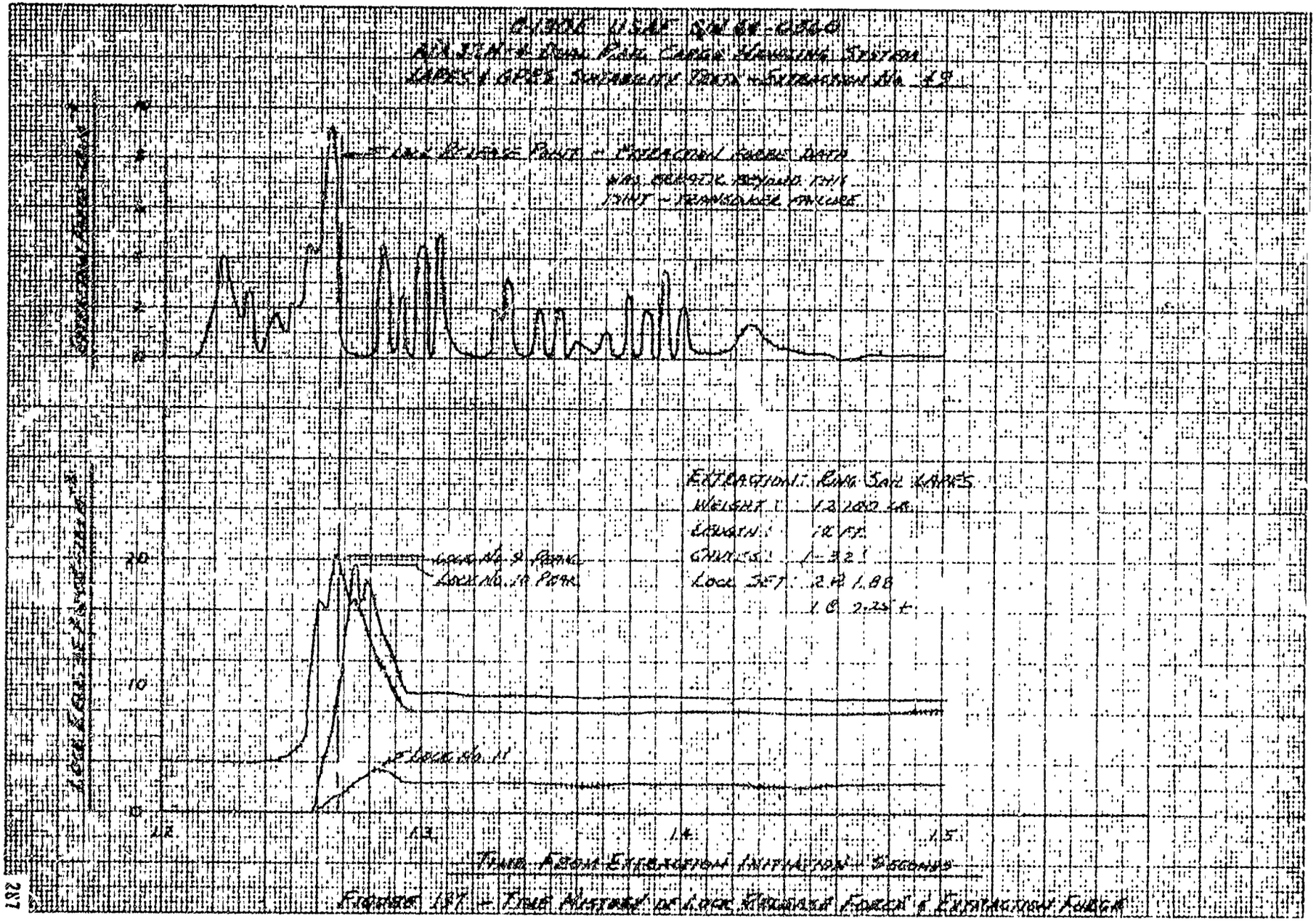
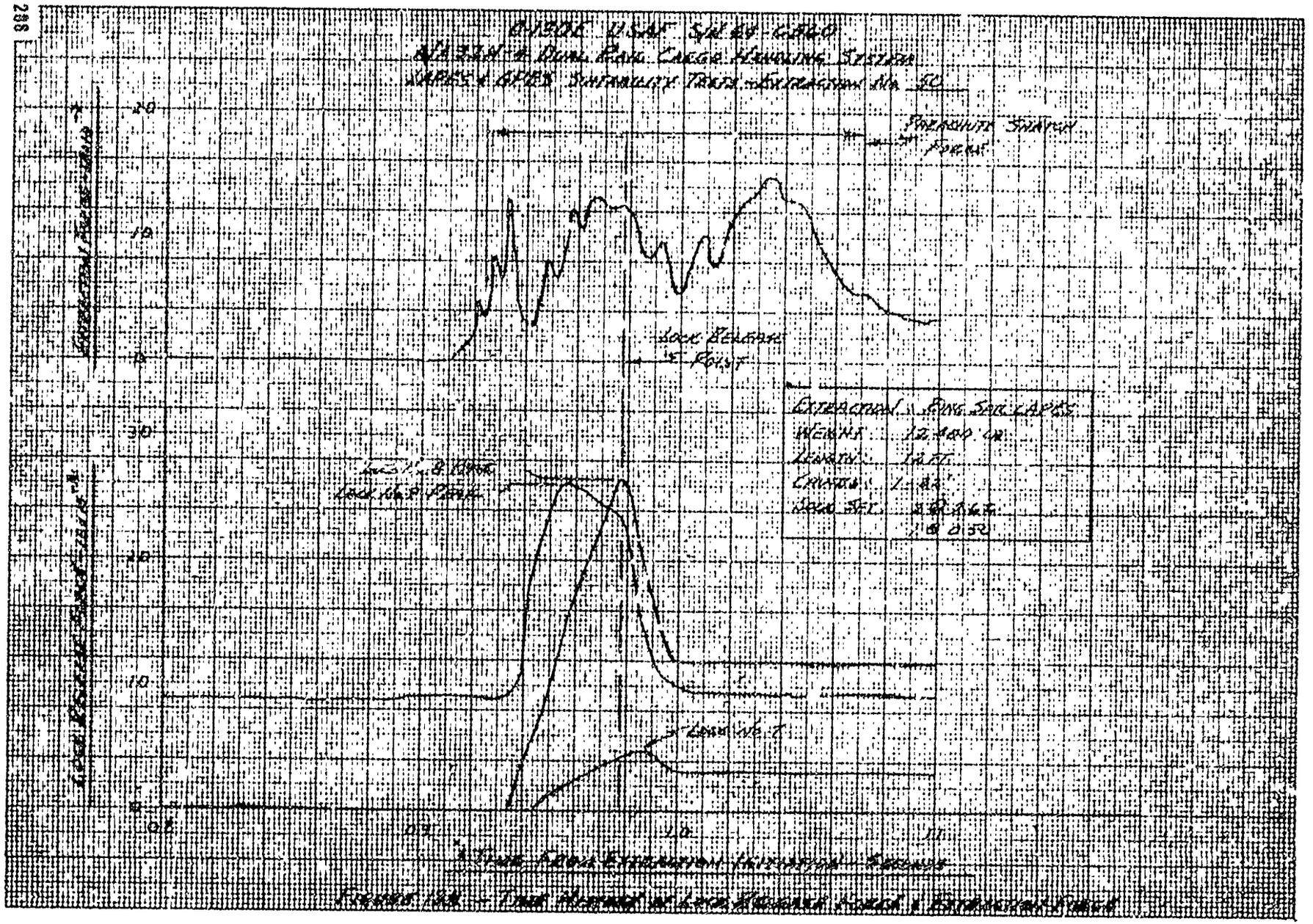
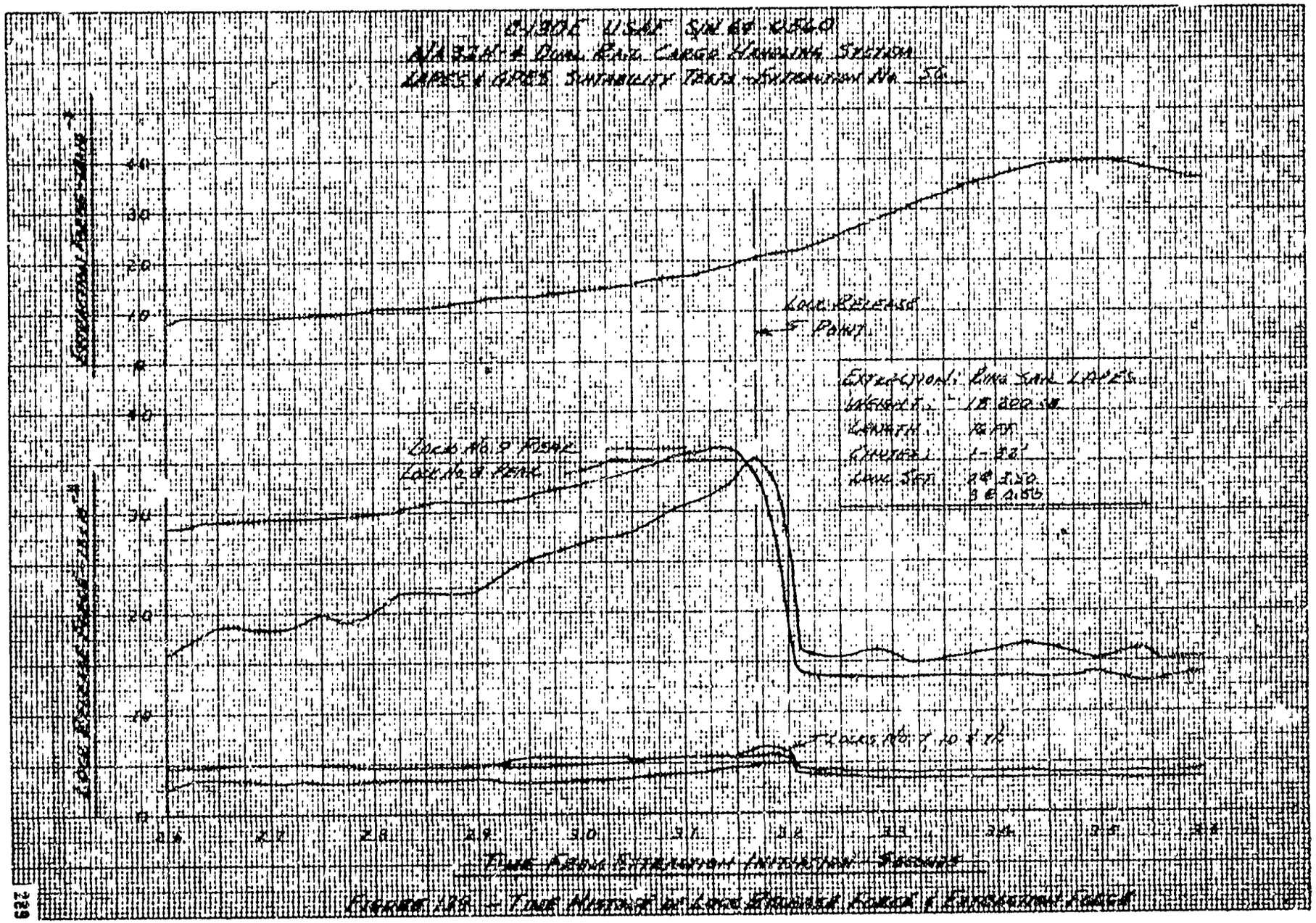
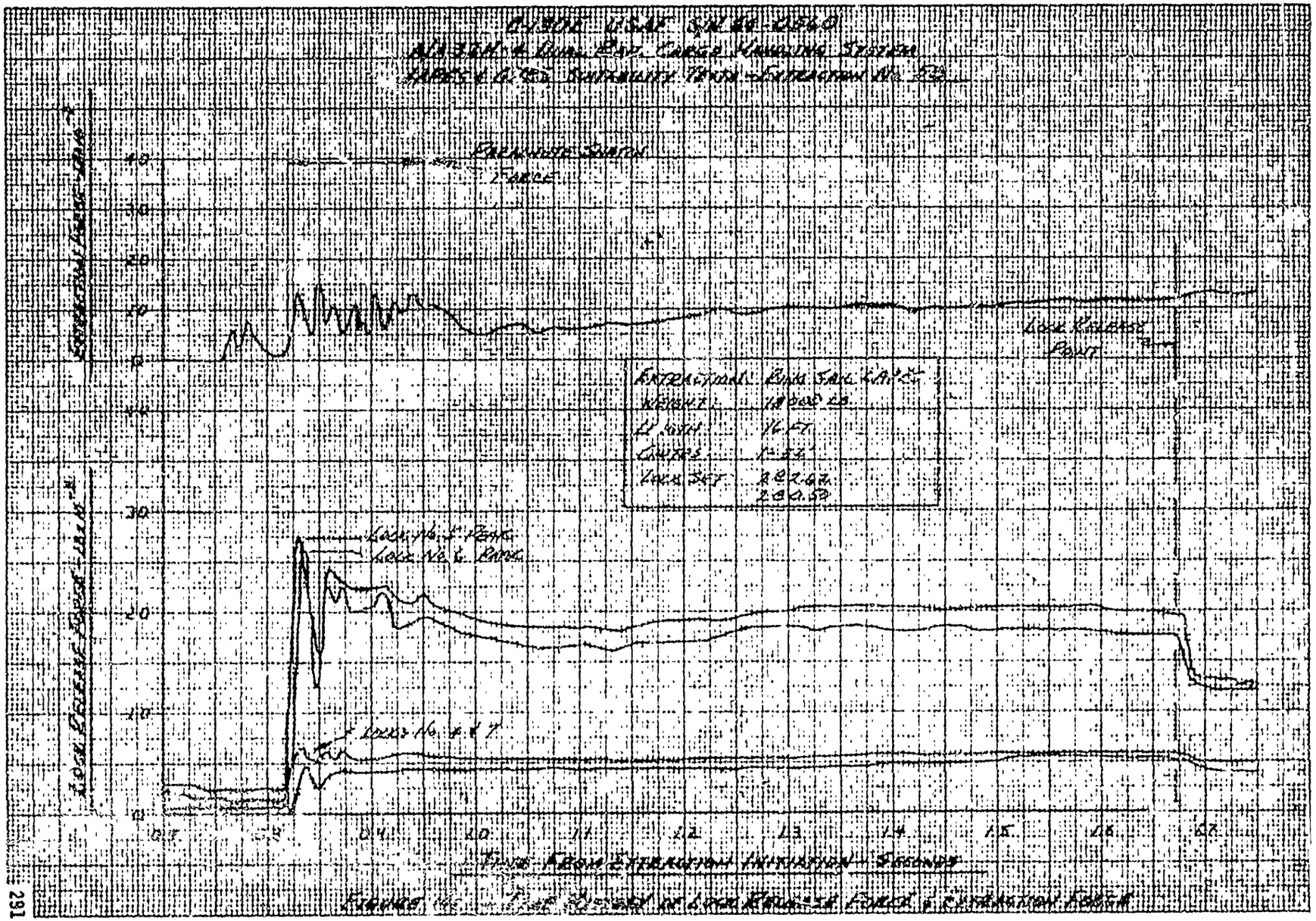


Figure 187 - Time History of Laser Induced Fluorescence Signals

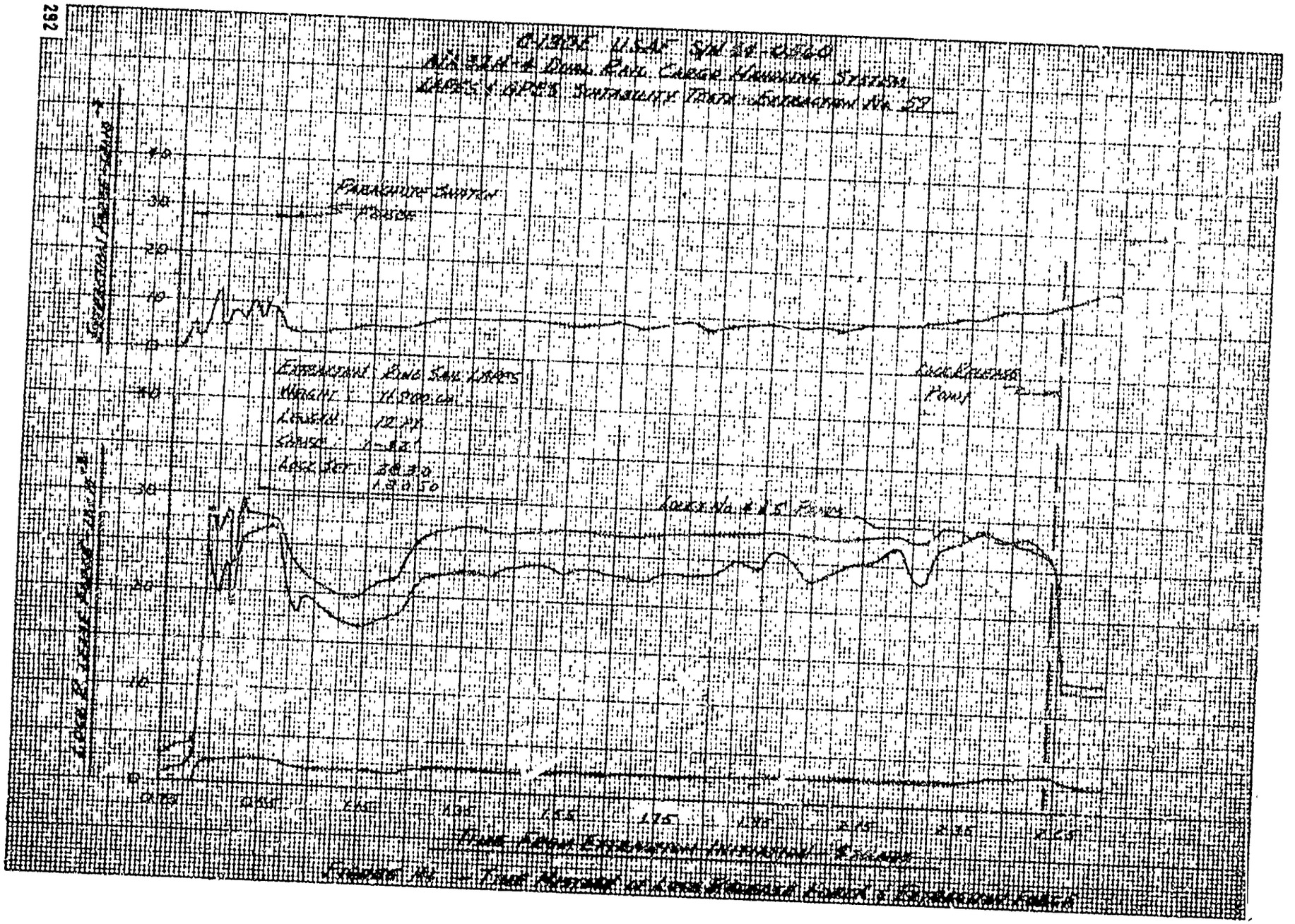

Pressure Sensor
Force
Load Release
Force
Extraction Ring Seal Cap
Weight
Length
Load Set
Load No. 2
Load No. 1
Time

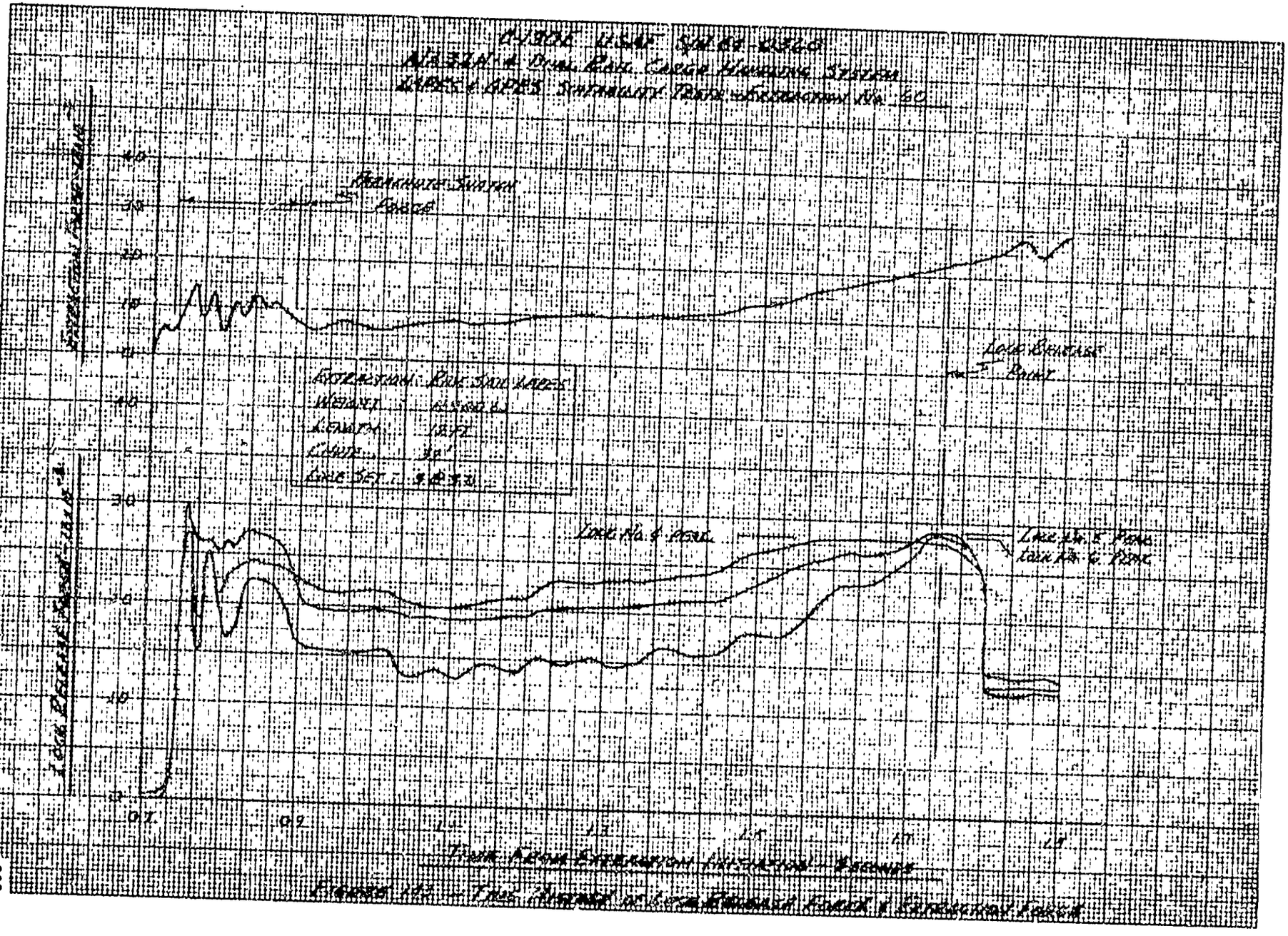


229



291





293

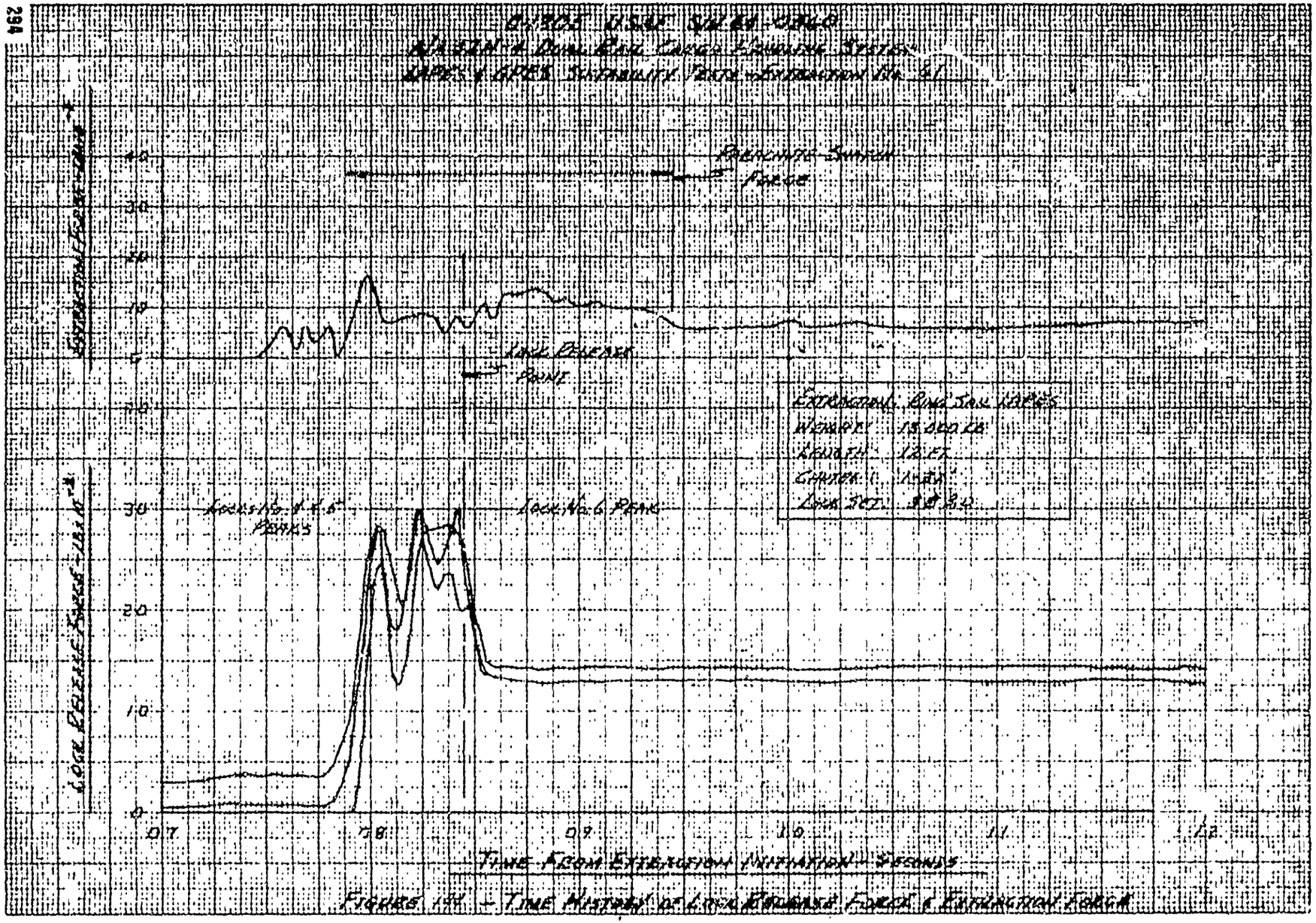


FIGURE 144 – TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE

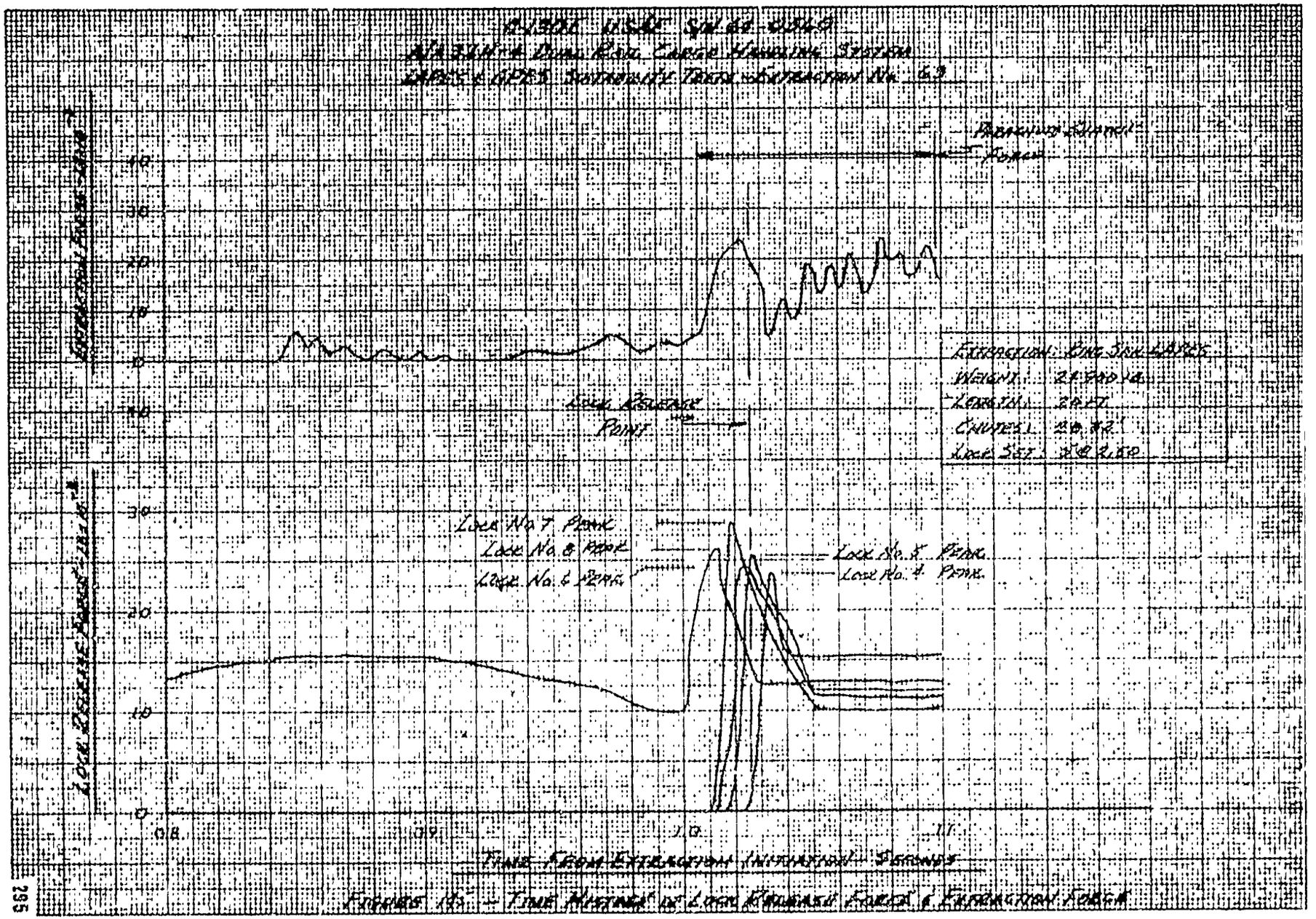
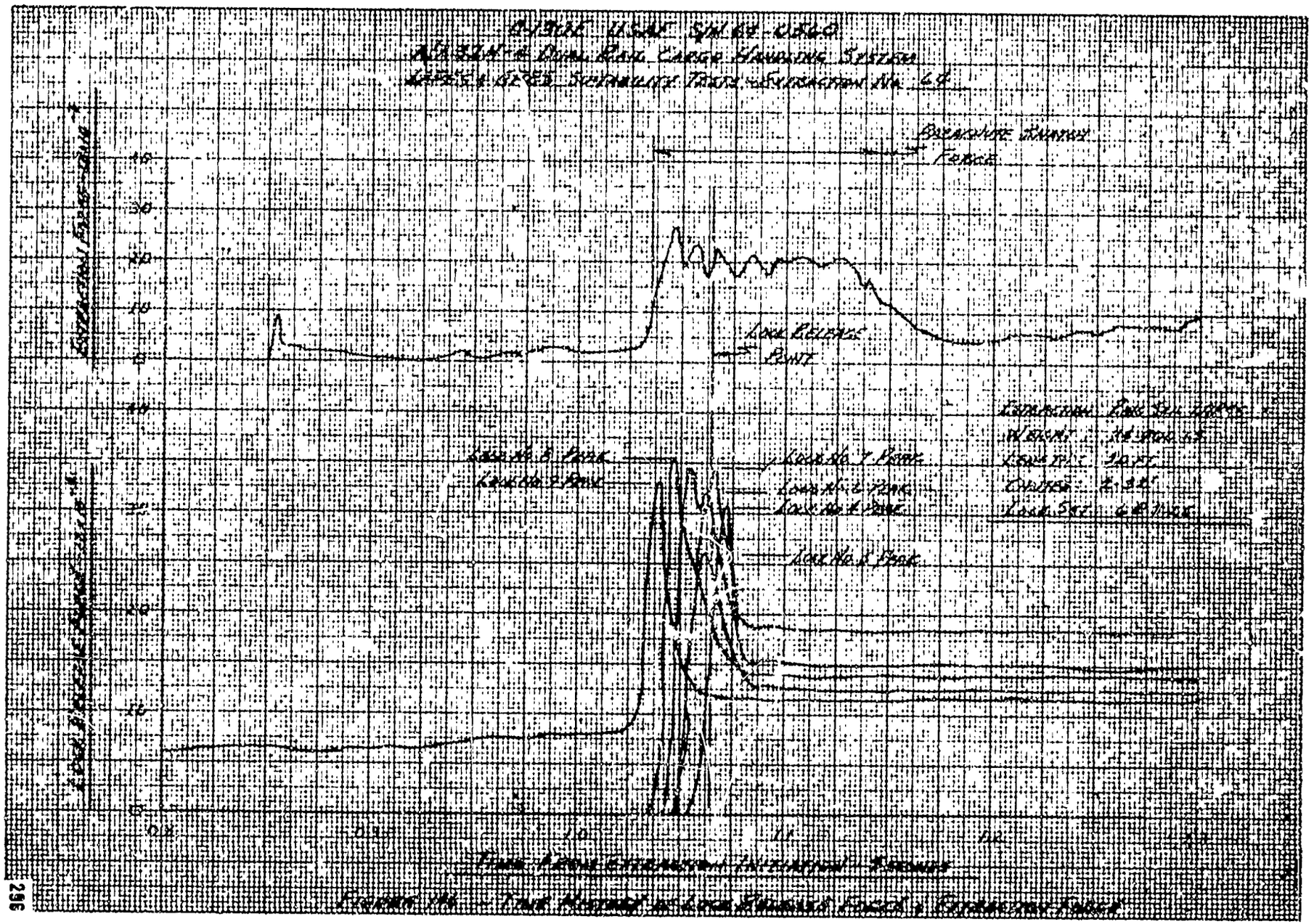
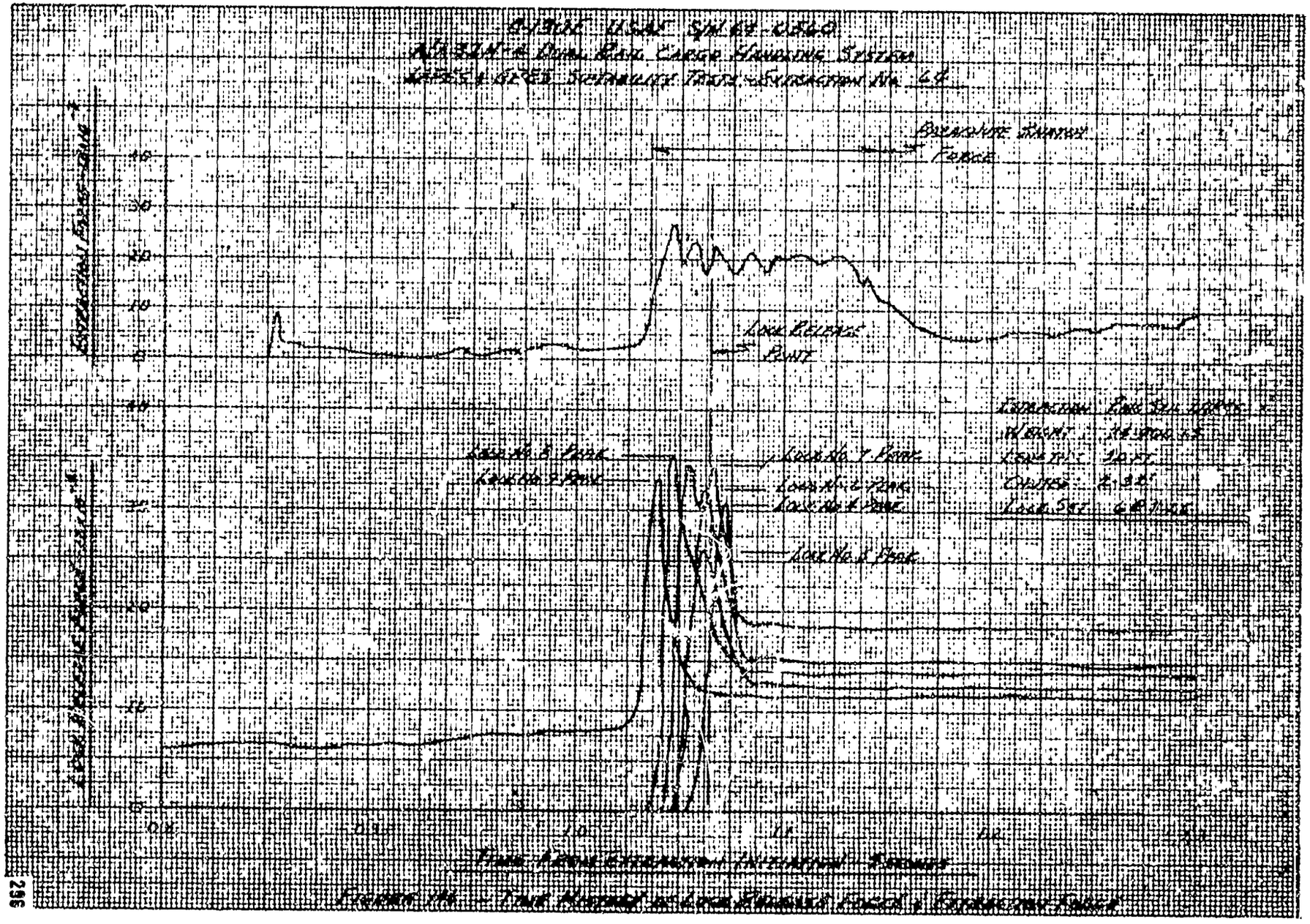


Figure 193 — Time History of Lock Resistance Force & Extraction Force




Effective Runway Force
Load Release Point
Load on 3 Feet
Load on 2 Feet
Load on 1 Foot
Load on 4 Feet
Load on 5 Feet
Time After Engagement (Seconds)

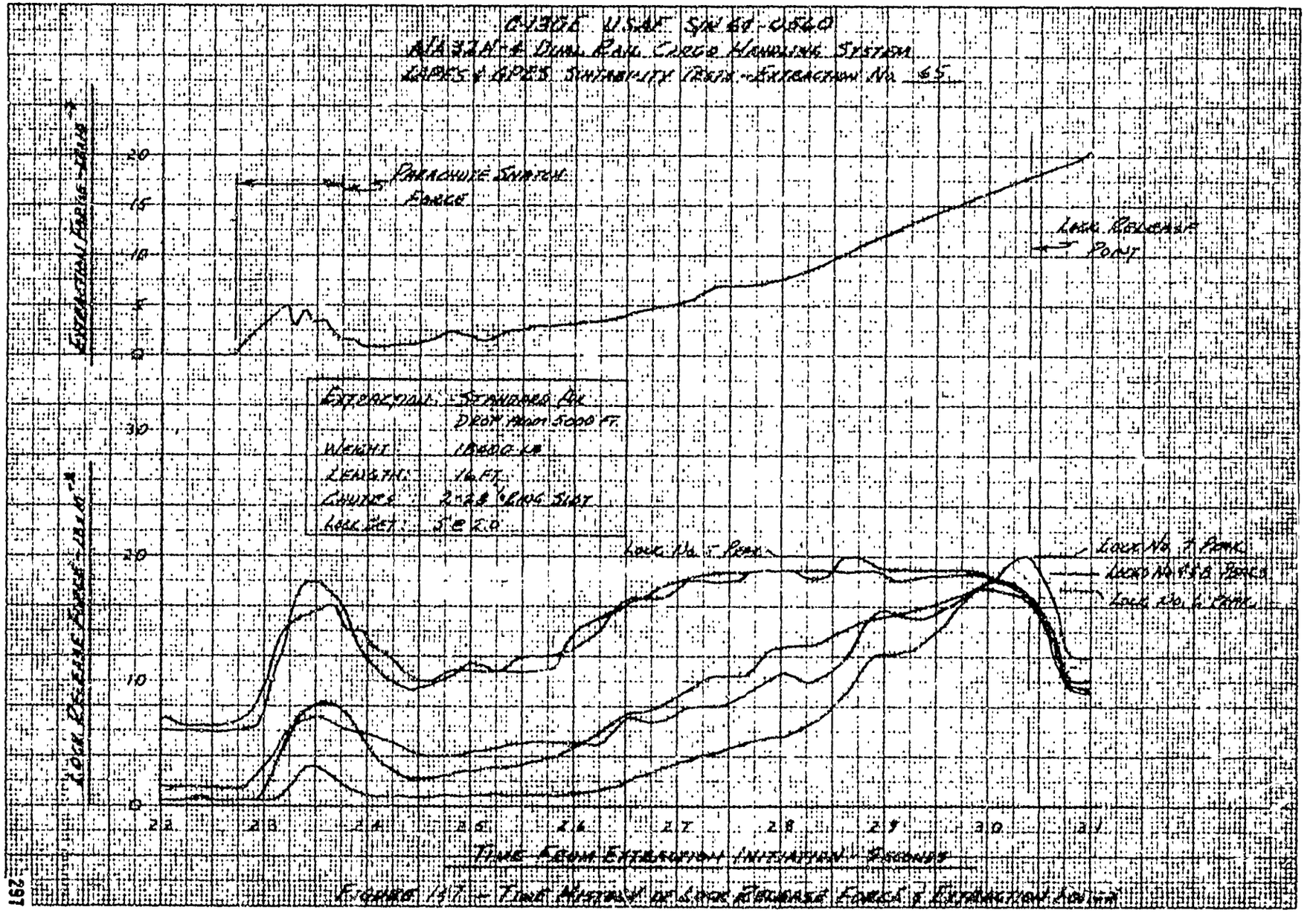


FIGURE 197 - TIME HISTORY OF LOCK RELEASE FORCES & EXTRACTION FORCE

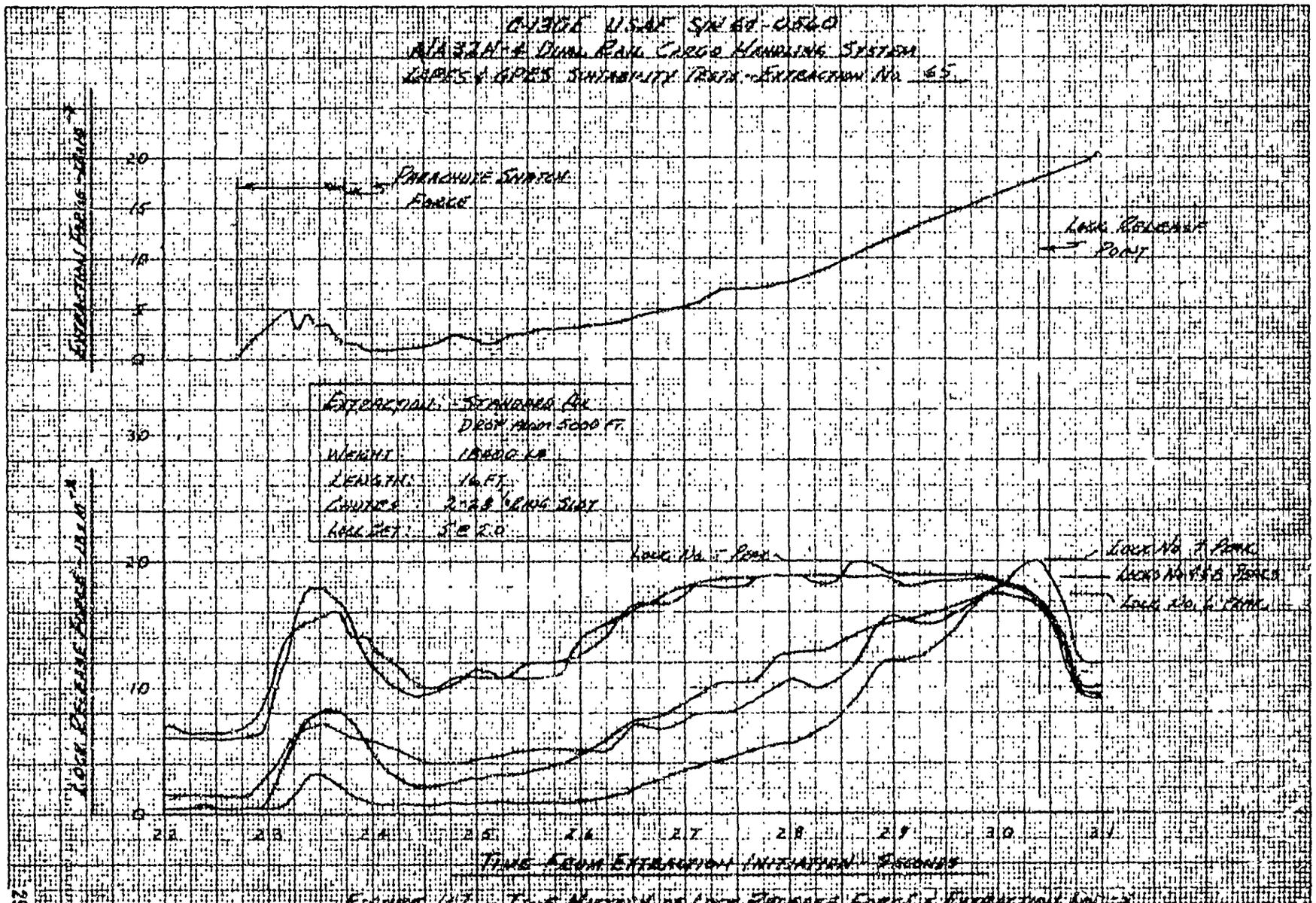
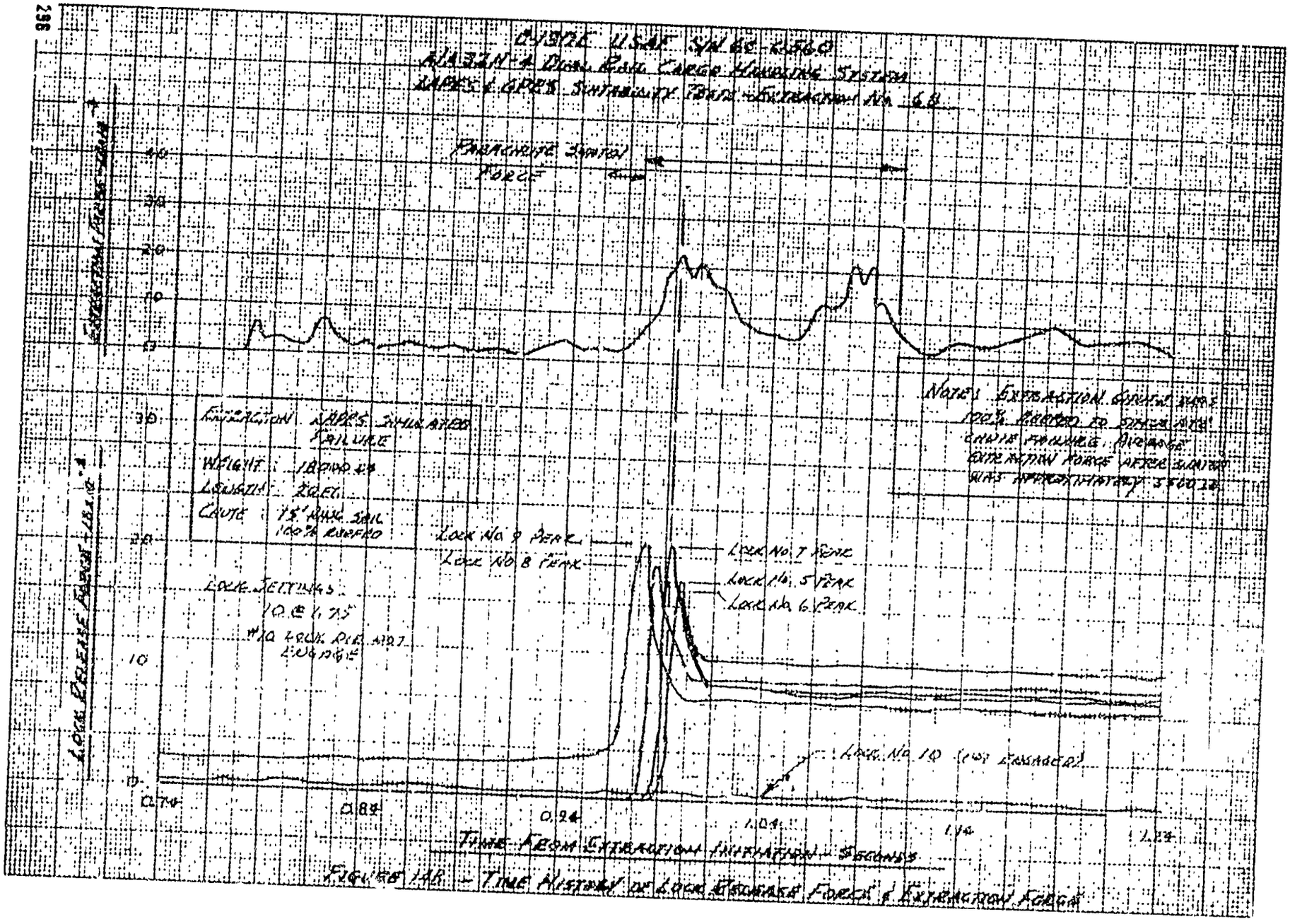


Figure 47 - Time History of Load Restraint Force & Extraction Force


C-5A/B USAF SYSTEMS PROG
AIRBORNE Elec. Cargo Handling System
Cargo & Crew Restraint Tests Extraction No. 68
Extraction Limited Force
Extraction Cables Simulated Failure
Weight: 180,000 lb
Length: 2661
Gaute: 15° Max Sail 100% Runno
Lock No 9 Peak
Lock No 8 Peak
Lock No 7 Peak
Lock No. 5 Peak
Lock No. 6 Peak
Lock No 10 (on transducer)
Lock Settings 10 @ 4.75 Min Lock Pin Diameter
Notes: Extraction Cables were 100% Proofed to Simulate Cable Failure. Average Extraction Force after Cables were Simulated 35000 lb
Longitudinal Force (1000 lb)
Time from Extraction Initiation - Seconds
Figure 68 - Time History of Lock Stroke Force & Extraction Force

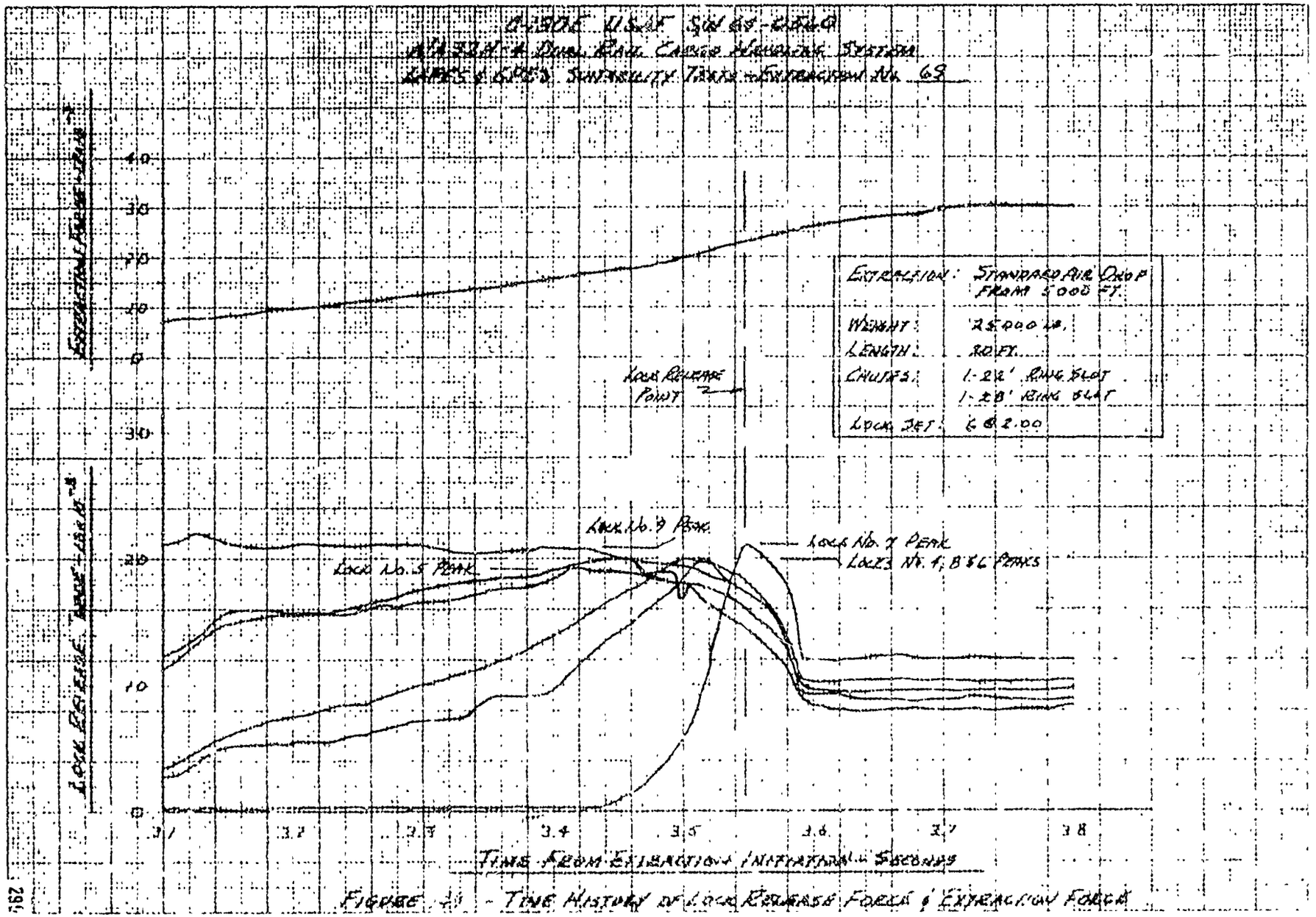
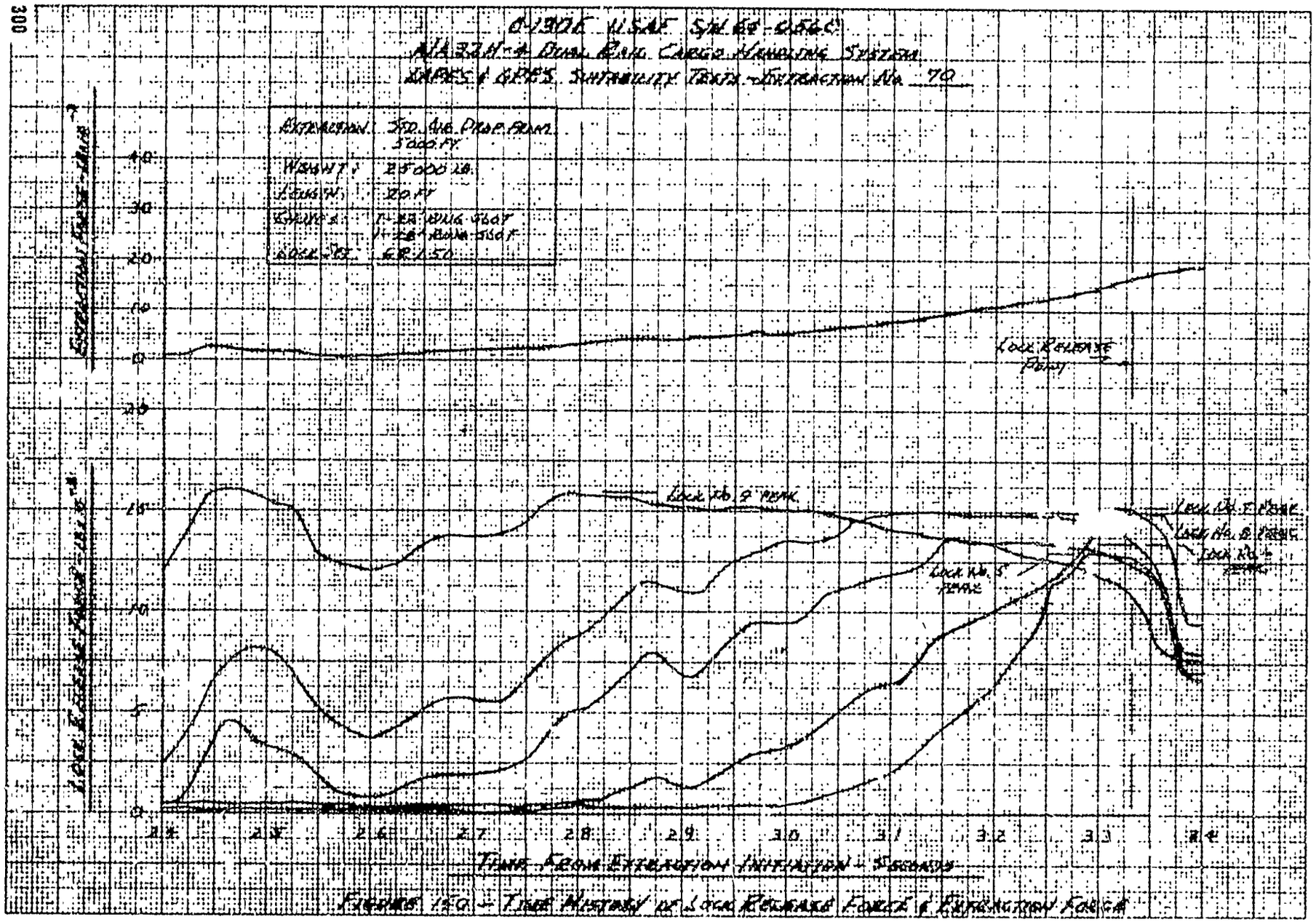
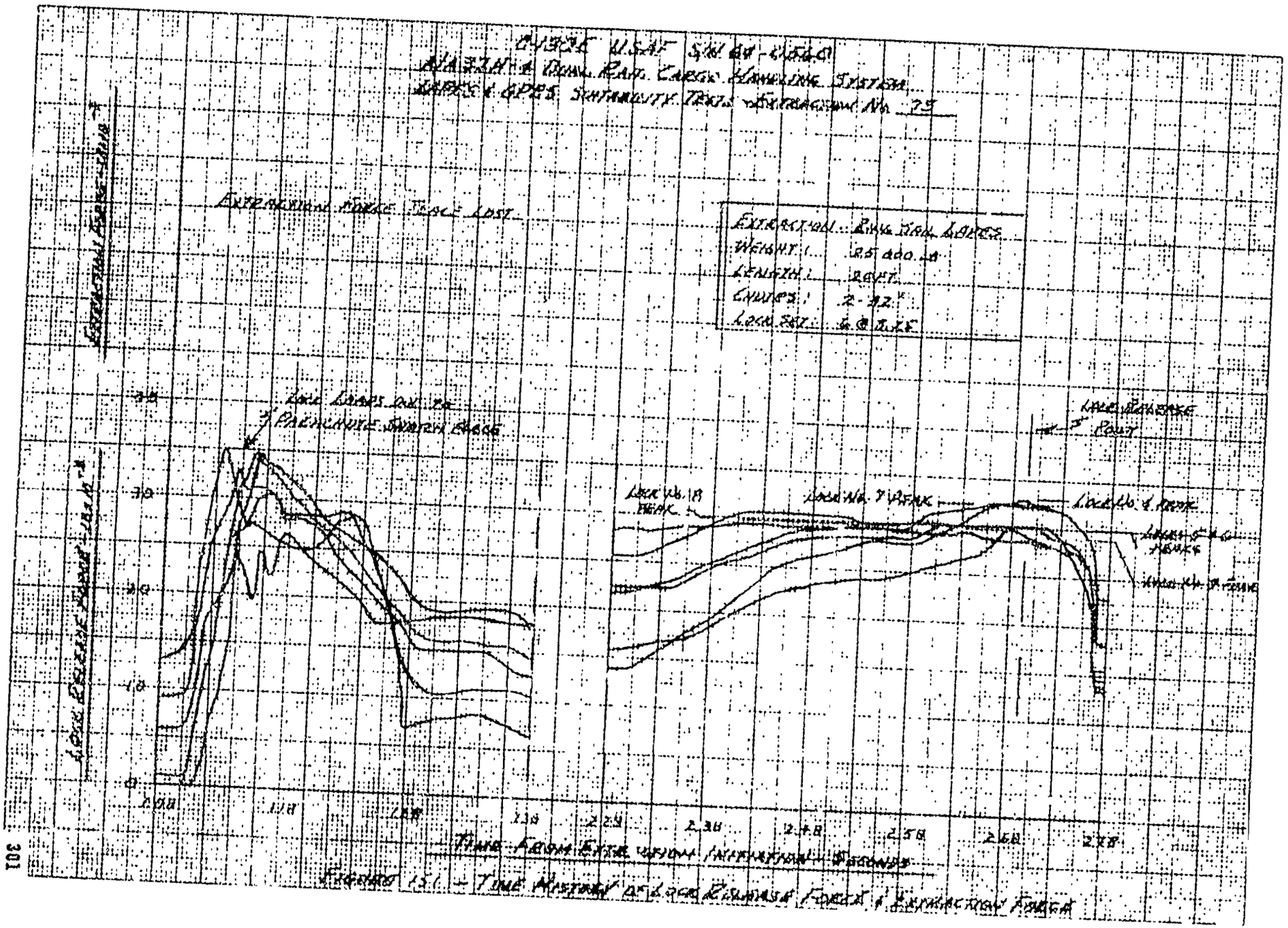


FIGURE 41 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE


300
Extension: 350 Aug Prop Ram 3000 PSI
Weight: 25000 lb.
Length: 20 ft
Lock Release Force
Lock No. 2 Peak
Lock No. 1 Peak
Lock No. 5 Peak
Lock No. 4 Peak
Lock No. 3 Peak
Time From Extension Initiation - Seconds


Extraction Ring Data Sheet
Weight: 25 000 lb
Length: 20 ft
Chutes: 2 - 22 ft
Load Set: 6 @ 2,25
Extraction Force Test Cost
Load Cycles on the 5 Parachute Shroud Lines
Load Reference 5 Point
Load No. 1 Peak
Load No. 2 Peak
Load No. 3 Peak
Load No. 4 Peak
Load No. 5 Peak
Load No. 6 Peak
Load Cycle Force - Lbs x 10³
Time After Extraction Initiation - Seconds
Figure 15 - Time History of Load Cycles of Chutes 1 & 2 Extraction Force

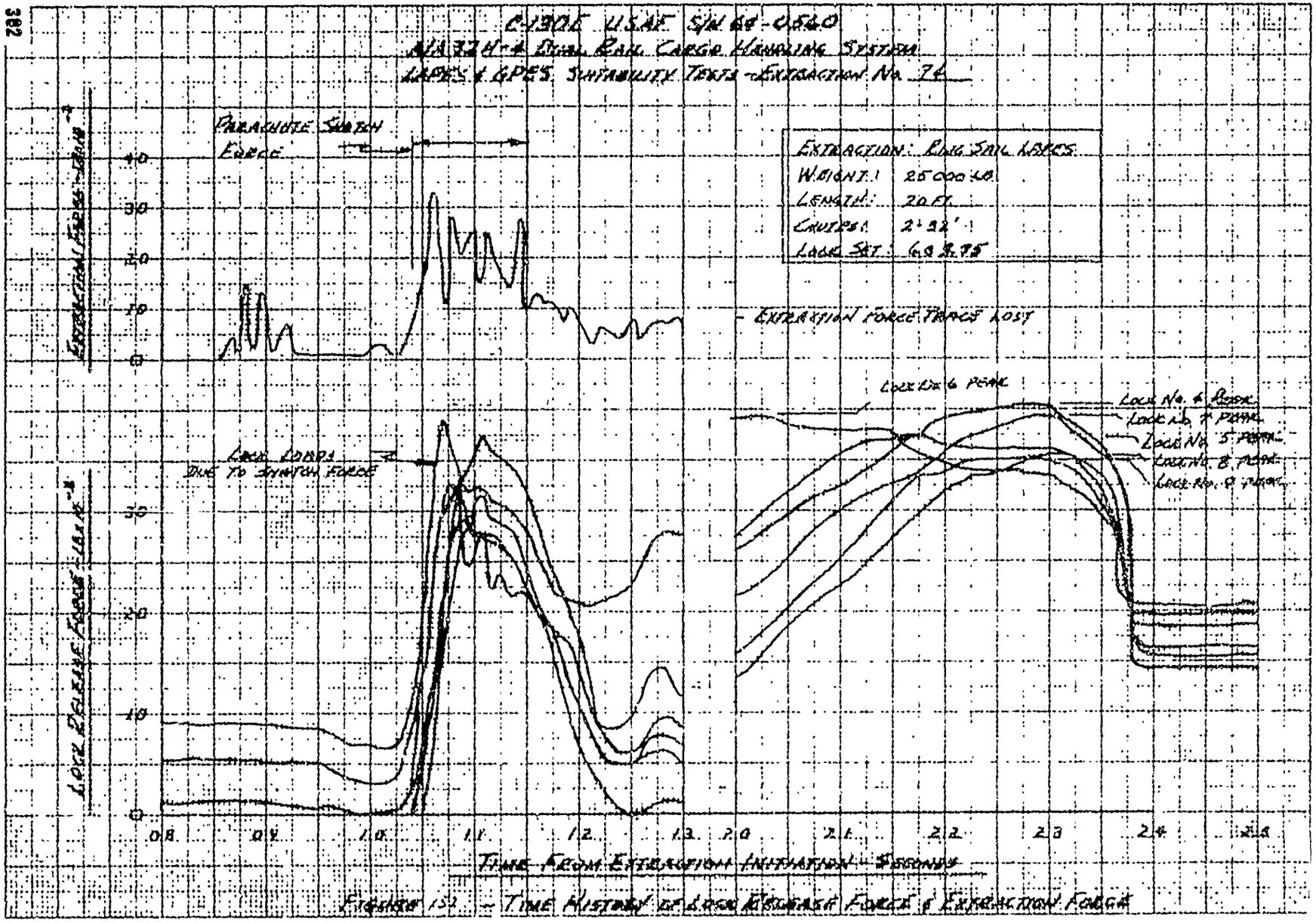


Figure 152 - Time History of Lock Release Force & Extraction Force

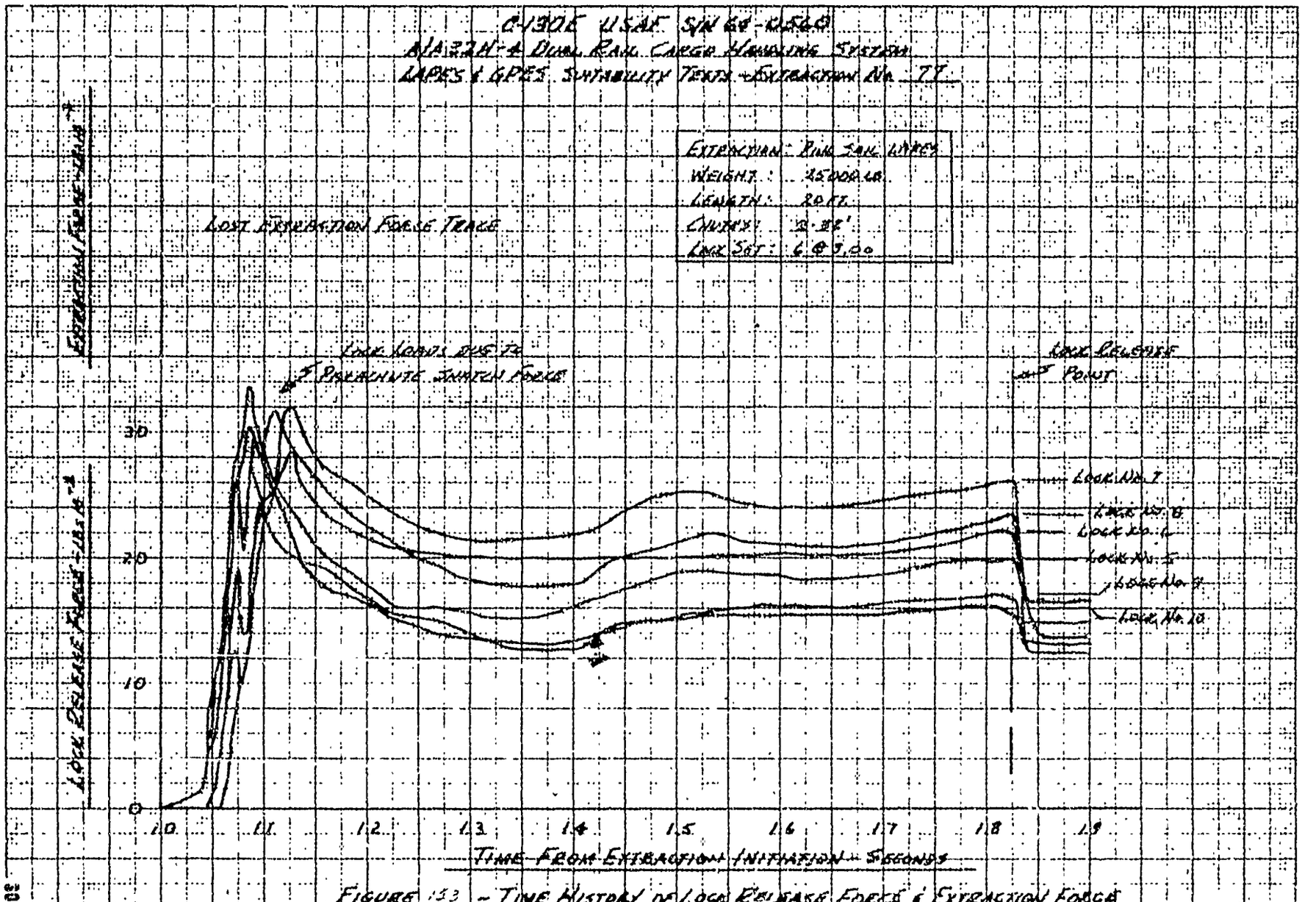


FIGURE 153 - TIME HISTORY OF LOCK RELEASE FORCE & EXTRACTION FORCE

C-130E USAF S/N 69-0580
A/A 32H-4 Dual Rail Cargo Handling System
Cables & Pipes Suitability Tests - Extraction No. 78

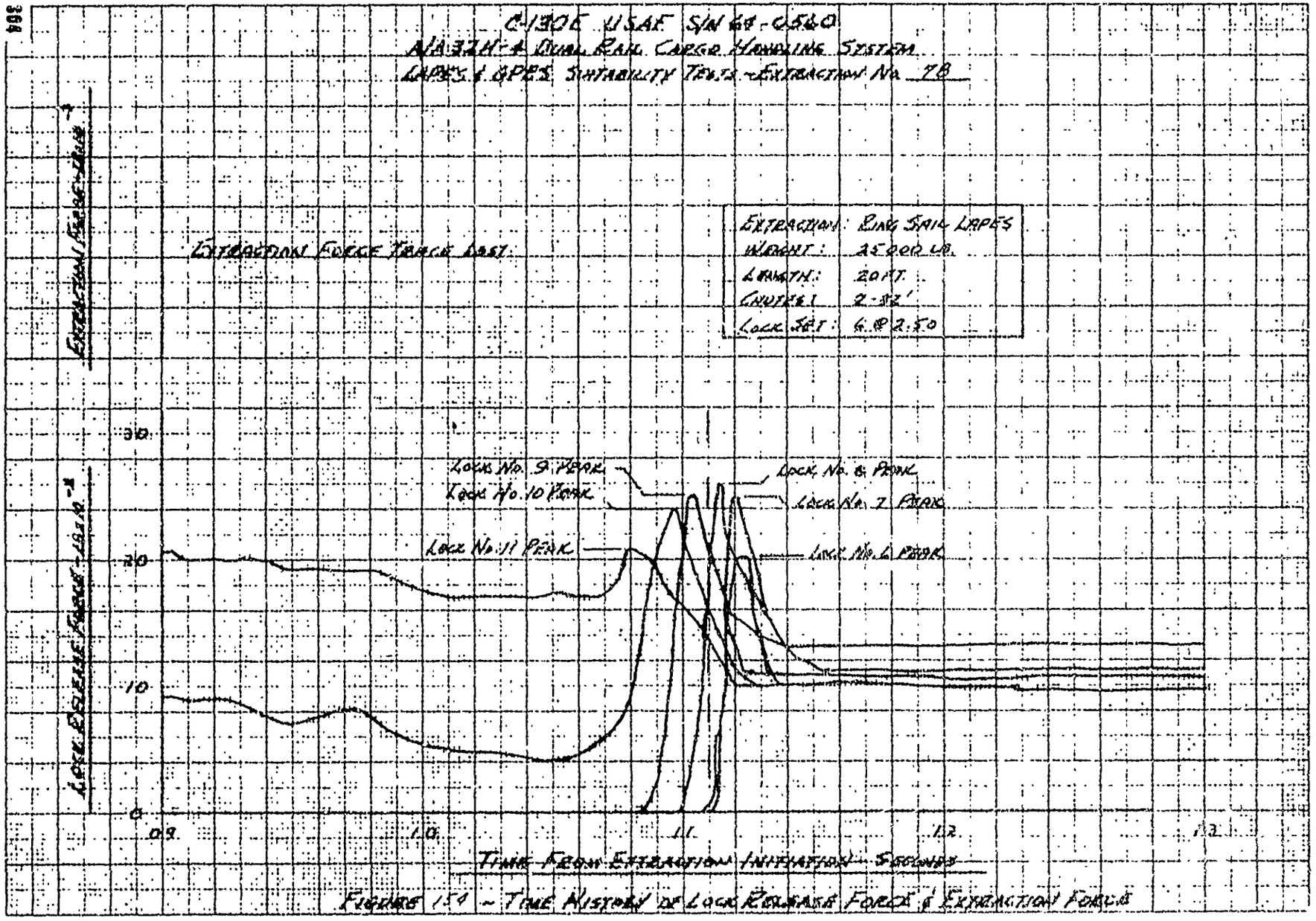


Figure 154 - Time History of Lock Release Force & Extraction Force

APPENDIX II

GENERAL AIRPLANE AND RAIL SYSTEM INFORMATION

DIMENSION AND DESIGN DATA (TAKEN FROM REFERENCE 3)

General Dimensions:

Wing span	132.58 ft
Height over vertical tail (referenced to ground)	38.50 ft
Length, maximum reference line level	97.75 ft
Stabilizer span	52.67 ft
Cargo compartment	
length	41.00 ft
width	10.25 ft
height	9.00 ft

Areas:

Wing area, total including ailerons, flaps, and 226 sq ft of fuselage	1745.5 sq ft
Wing flap area (extended) total	342.0 sq ft
Aileron area aft of hinge line, total including 5.8 sq ft total tab area	110.0 sq ft
Horizontal tail area, total	545.0 sq ft
Stabilizer area forward of elevator hinge	381.0 sq ft
Elevator area aft of hinge including 1.59 sq ft of overhanging external balance forward of hinge and 19.90 sq ft of tab area, total	155.0 sq ft
Vertical tail areas, total	300.0 sq ft
Fin area, total	225.0 sq ft
Rudder area, aft of hinge line, including 5 sq ft of tab area	75.0 sq ft

Specific Dimensions:

Wings.

Chord	
At root	192.0 in.
At construction tip	100.0 in.
Mean aerodynamic chord	164.5 in.
Airfoil section designation	

At root	NACA 64A318
At construction tip	NACA 64A412
Incidence:	
At root	3 deg
At construction tip	0 deg
Sweepback at 18-percent chord	0 deg
Dihedral angle at 18-percent chord	2 deg 30 min
Aspect ratio	10.09
Ailerons.	
Span	19.95 ft
Chord (average percent wing chord)	28 ft
Flaps (Lockheed-Fowler type).	
Span, exclusive of cutouts (percent of wing span)	60.2
Chord	
Center section	57.5 in.
Outer panel	49.5 in.
Horizontal Tail.	
Span	52.67 ft
Mean aerodynamic chord	134 in.
Dihedral	0 deg
Incidence	1 deg 45 min
Aspect ratio	5.02
Vertical.	
Height above top of fuselage	22.2 ft
Aspect ratio	1.81
Control Surface Movements:	
Rudder	35 deg rt, 35 deg lt
Rudder tab	25 deg rt, 25 deg lt
Elevators	40 deg up, 15 deg dn
Elevator tab	25 deg up, 6 deg dn
Ailerons	20 deg above 20 deg below

Aileron control wheel	120 deg rt, 120 deg lt
Wing flap (maximum extension)	36 deg

Operational Limitations:

Center of Gravity Limits.

The center of gravity limits are presented in figure 1.

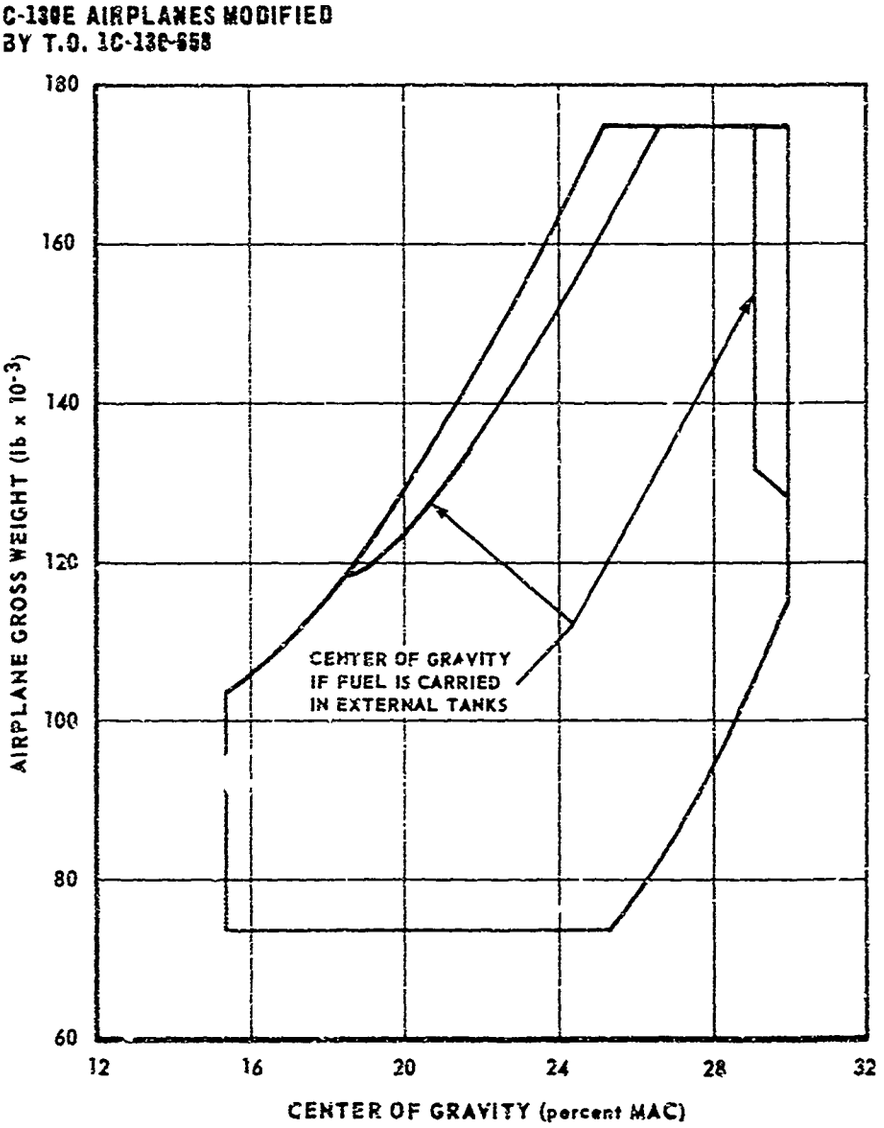


Figure 1 CENTER OF GRAVITY ENVELOPE

Aircraft Weight Limits.

Condition	Weight (lb)	Limitations
Max takeoff (normal)	155 000	2.50 g
Max takeoff (overload)	175 000	2.25 g
Max landing (design)	130 000	9 fps rate of sink
Max landing (overload)	175 000	5 fps rate of sink

Configuration Limits:

Load limit, flaps down (18 - 36 deg)
positive 2.0, negative 0

100-percent flaps, 36 deg	145 KEAS
50-percent flaps, 18 deg	183 KEAS
Landing gear door open	168 KEAS
Paratroop deflector doors open	150 KEAS
Cargo door (upper) open	150 KEAS

Power Plant and Accessories:

Engine.

Manufacturer	Allison
Designation	T56-A-7

ENGINE RATINGS

Rating	Engine rpm	Shaft hp (hp)	Equivalent shp (hp)	TIT (deg C)	Time Limit
Military	13820	3455	4050	977	30 min
Normal	13820	3443	3730	932	- - -

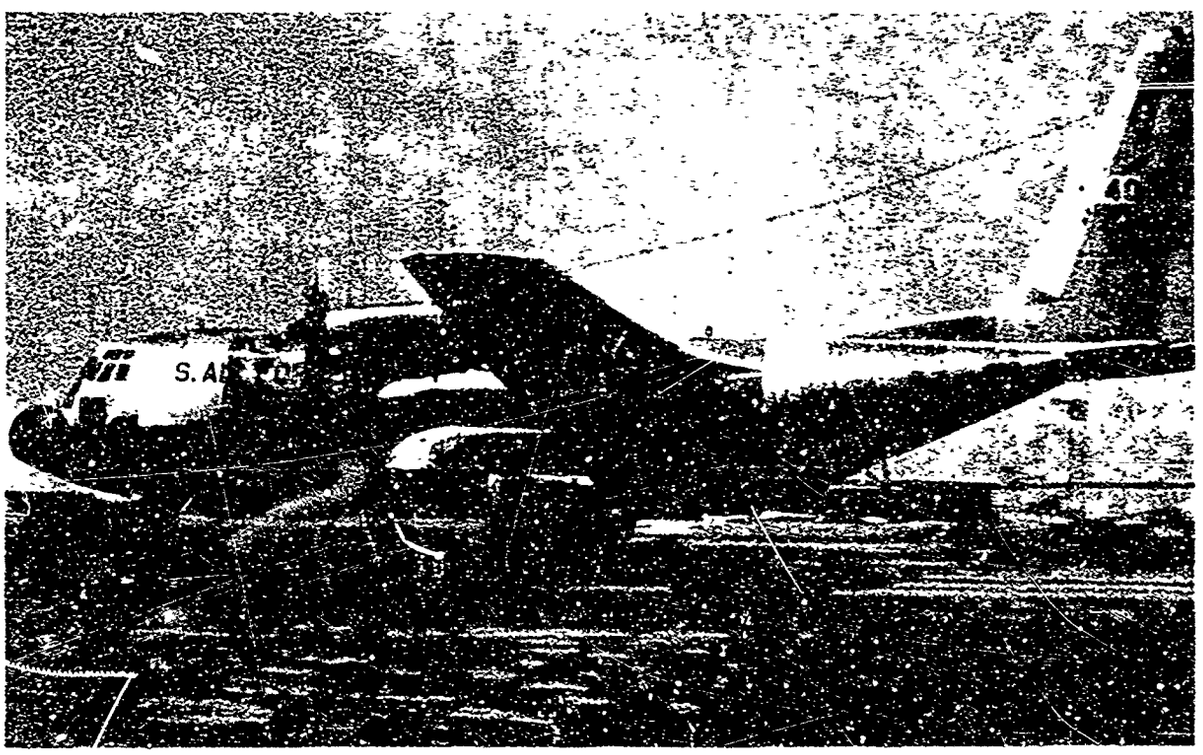
Propeller.

Manufacturer	Hamilton Standard
Type	Hydromatic
Model	54H60-91
No. of blades	4
Blade No.	A-7111B-2

Blade angle	23.5 deg
Diameter	13.5 ft
Activity factor	178.0
Gear reduction ratio	13.54

Gas Turbine Compressor.

Manufacturer	AiResearch
Model	85-65



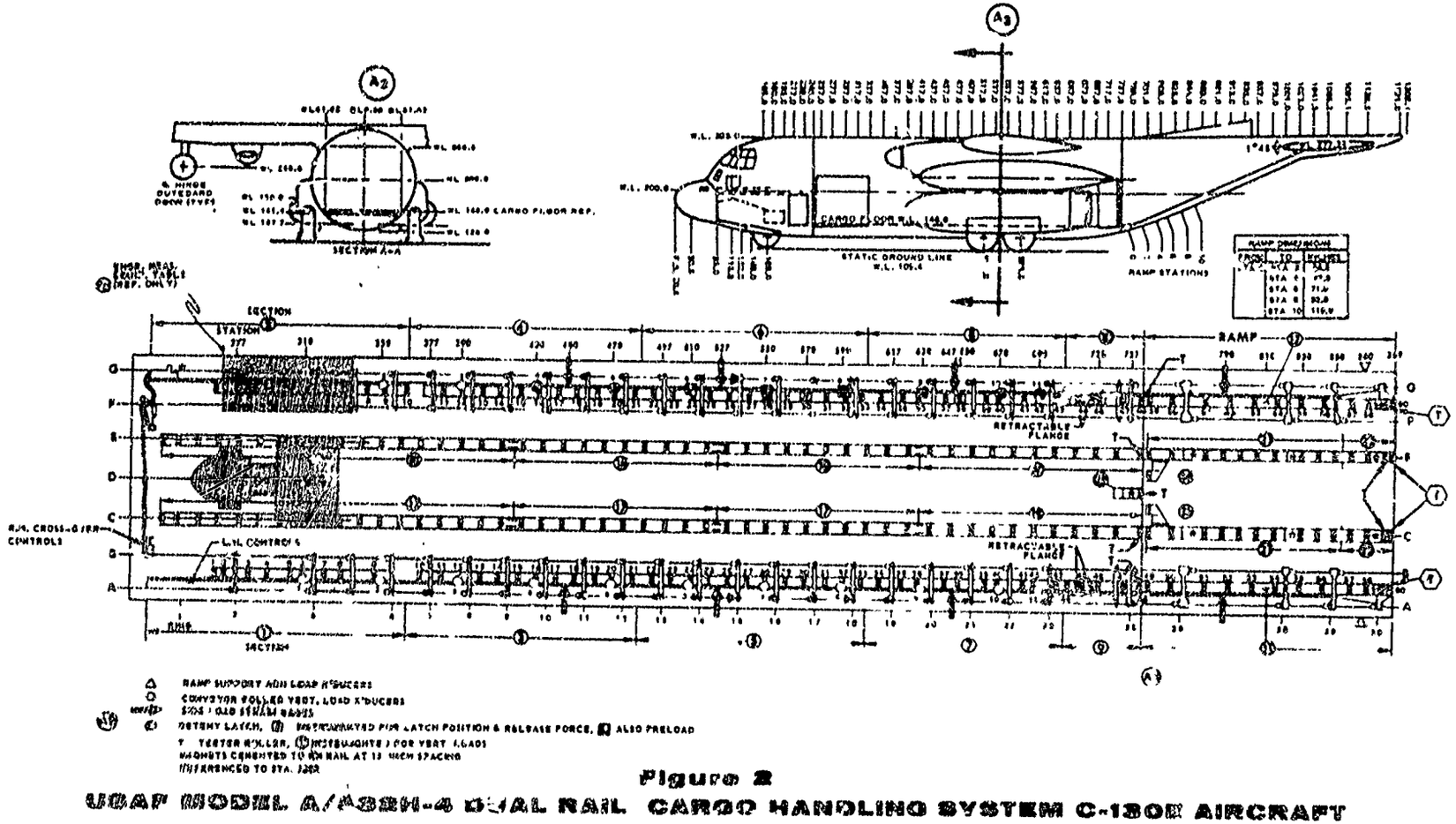


Figure 2

USAF MODEL A/A38H-4 DUAL RAIL CARGO HANDLING SYSTEM C-130E AIRCRAFT

A/A32H-4 DUAL RAIL CARGO HANDLING SYSTEM

System Design Limits (Taken from References 9 and 11):

Ultimate load factors for takeoff, flight, and landing with the load pallets or platforms in a stowed condition:

Down Load Factor	5.1 g
Up Load Factor	2 g
Forward Load Factor	8 g
Aft Load Factor	2 g
Side Load Factor	1.5 g

Ultimate load factors during ejection of loaded platforms while platforms are within the aircraft:

Down Load Factor	2.25 g
Up Load Factor	1.5 g
Side Load Factor	1.5 g

Ultimate load factors for loading of platforms in the aircraft:

Down Load Factor	3 g

Ultimate load factors during ejection of loaded platforms while platforms are on ramp section:

Down Load Factor	2.25 g
Side Load Factor	0.4 g

The outboard lateral spacing tolerance was ±1/8 inch.

The conveyor roller design limits were:

Design Load	3000 lb per roller
Ultimate Load	4500 lb per roller
Roller Size	2 1/4 ±1/16 inches diameter

Teeter-Roller Design Limits.

No appropriate design limits for the teeter-rollers were specified in reference 11. It was assumed the rollers were designed to carry an equal load for a platform weight of 40 000 pounds teetering at the end of the ramp. The instrumented rollers were laboratory tested and calibrated for a limit load of 10 000 pounds per roller. Reference 9 calculated the roller reactions assuming the ramp floor as an elastic beam. By use of the Three Moment Equation for indeterminate beams, the roller reactions were calculated for a total beam length of 108 inches. Roller reactions calculated were:

Outboard teeter-rollers:

$$10.5w = R_1 = R_4$$

Intermediate teeter-rollers:

$$40w = R_2 = R_3$$

where w = distributed load = platform weight/total lateral length = W/108 lb/inch.

For a 25 000-pound load, w = 25 000/108 = 231.5 lb/inch, therefore:

$$R_1 = R_4 = 10.5w = 2625 \text{ lb}$$

$$R_2 = R_3 = 40w = 9875 \text{ lb}$$

The 10 000-pound load per teeter roller was therefore considered adequate for test observations and each roller was laboratory tested and calibrated for this load.

WEIGHT AND BALANCE

The test airplane gross weight and center of gravity were determined at the test site prior to each mission when the wind conditions permitted. The airplane was fueled and loaded, with the exception of the flight crew, for the test mission when weighed. The scales used at the test site were type MM-2 Computer-Planner Aircraft Weighing System manufactured by Baldwin-Lima-Hamilton Corporation, Boston, Mass. These scales consisted of five platforms (one for each landing gear) and a computer-planner unit.

The airplane weight after extraction was usually 103 000 pounds with a cg of 24.8-percent MAC. This included the basic airplane crew and 26 200 pounds of fuel in wing tanks 1, 2, 3, and 4. When the test conditions called for an airplane cg near the forward limit after extraction, a dummy load was placed forward in the cargo compartment and its equivalent weight in fuel was off-loaded. The extraction load was then placed in the mid or aft portion of the cargo compartment depending on whether a forward or aft cg prior to extraction was required. On several tests small lead weights were placed in the equipment bins located in the cargo door and in the sides of the airplane adjacent to the ramp. This produced an aft airplane cg after extraction. A basic airplane weight, cg determination, and partial fuel tank calibration were obtained early in the program using the AFFTC scales.

The extraction loads were weighed at the test site on 50-ton platform scales, serial number 1210281, manufactured by the Howe Corporation, Rutland, Virginia. These scales had an effective calibration date of 7 December 1965.

INSTRUMENTATION

The test instrumentation which was installed and maintained by the AFFTC included the following:

1. A photopanel installed in the forward portion of the cargo compartment.

2. A 36-channel oscillograph mounted on an equipment table in the forward right corner of the cargo compartment to record stability and control data.

3. A 50-channel oscillograph mounted on the equipment table to record rail system data.

4. A test boom on the right wing tip on which angle of attack and sideslip vanes were mounted.

5. A small panel containing a cg vertical acceleration indicator, an angle of sideslip indicator, an angle of attack indicator and a time correlation counter mounted above the nosewheel steering control to the left of the pilot's instrument panel. Additionally, a display of radar altitude was mounted on top of the main instrument panel, halfway between the pilot and copilot.

6. Three 35-millimeter cameras which ran at a speed of 400 frames per second: one in the aft section of the right pylon tank, one on the upper portion of the cargo compartment just aft of the wing box, and the other below the photopanel in the forward portion of the cargo compartment.

List of Parameters:

Photopanel	Range
Airspeed	50 to 850 kt
Pressure altitude	-1000 to 80 000 ft
Radar altitude	0 to 1000 ft
Turbine inlet temperature (4 engines)	0 to 1000 deg C
Flap position	0 to 100 pct
Outside air temperature	-40 to +60 deg C
Angle of attack	-10 to +30 deg
Angle of sideslip	20 ANL to 20 deg ANR
Vertical accelerometer (local)	-1.5 to +4 g
10-second sweep (stopwatch)	- - -
Elevator trim tab position	25 up to 6 deg down
Time correlation	0 to 99 999 counts
Event	- - -

Number One Oscillograph.

Angle of pitch	±40 deg
Angle of bank	60 LWD to 60 deg RWD
Angle of yaw	20 left to 20 deg right
Pitch rate	±40 deg/sec^2
Roll rate	±40 deg/sec^2
Yaw rate	±20 deg/sec^2
cg vertical acceleration	-1 to +4 g
Elevator position	40 up to 15 deg down
Longitudinal stick force	±200 lb
Aileron position (right only)	25 up to 15 deg down
Rudder position	35 left to 35 deg right
Radar altitude	0 to 1000 ft
cg longitudinal acceleration	-0.5 to +1.5 g
Angle of attack	-10 to +30 deg
Angle of sideslip	20 left to 20 deg right
Time correlation	- - -
Event	- - -

Number Two Oscillograph.

RH lock preload	0 - 4000 lb
Drogue chute force transfer	- - -
Hook engagement	- - -
Extraction force	0 - 30 000 lb/ 0 - 70 000 lb
RH latch movement	full movement range
RH latch release force	0 - 4000 lb
Platform movement	1/2 inch fore and aft
Platform velocity	full length of cargo floor and ramp
Platform position	1-foot intervals fore and aft
Rail sideload	0 - 6000 lb
Conveyor-roller load	0 - 5000 lb
Teeter-roller load	0 - 10 000 lb

Ramp arm loads	0 - 12 000 lb
Platform separation from airplane	- - -
Time correlation	- - -
Event	- - -

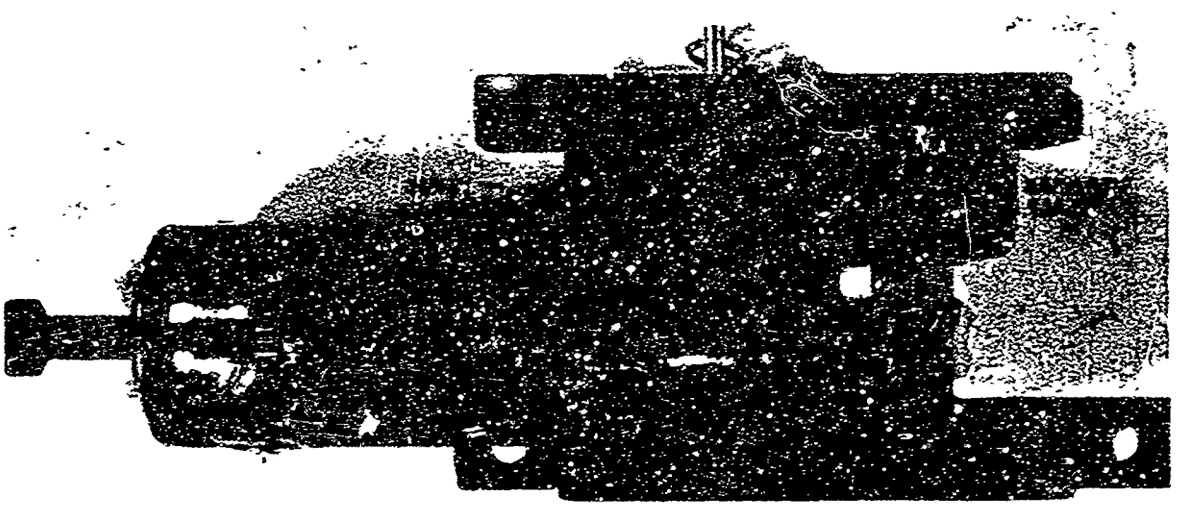


Figure 3 LOCK RELEASE FORCE STRAIN GAGES MOUNTED ON THE LOCK BODY

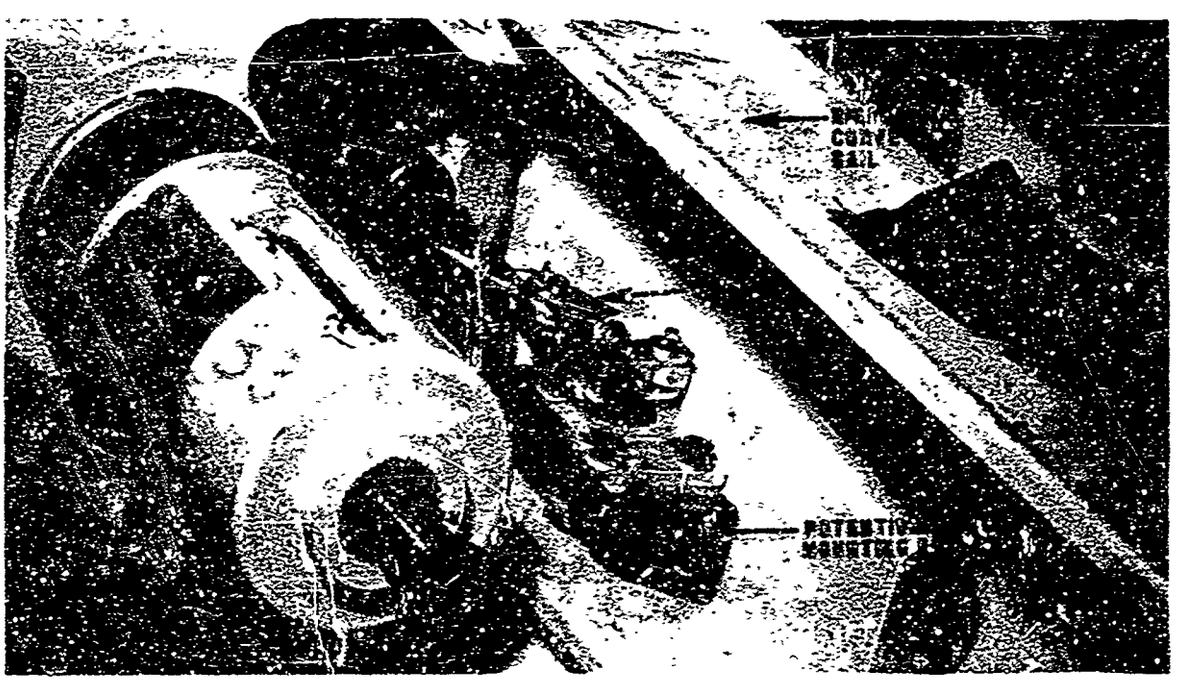


Figure 4 LATCH MOVEMENT LINKAGE AND TRANSDUCER



Figure 6 DATA RECORDING EQUIPMENT IN THE AIRPLANE



Figure 8 VARIABLE-RESTRAINT LOCK SETTING SCALE

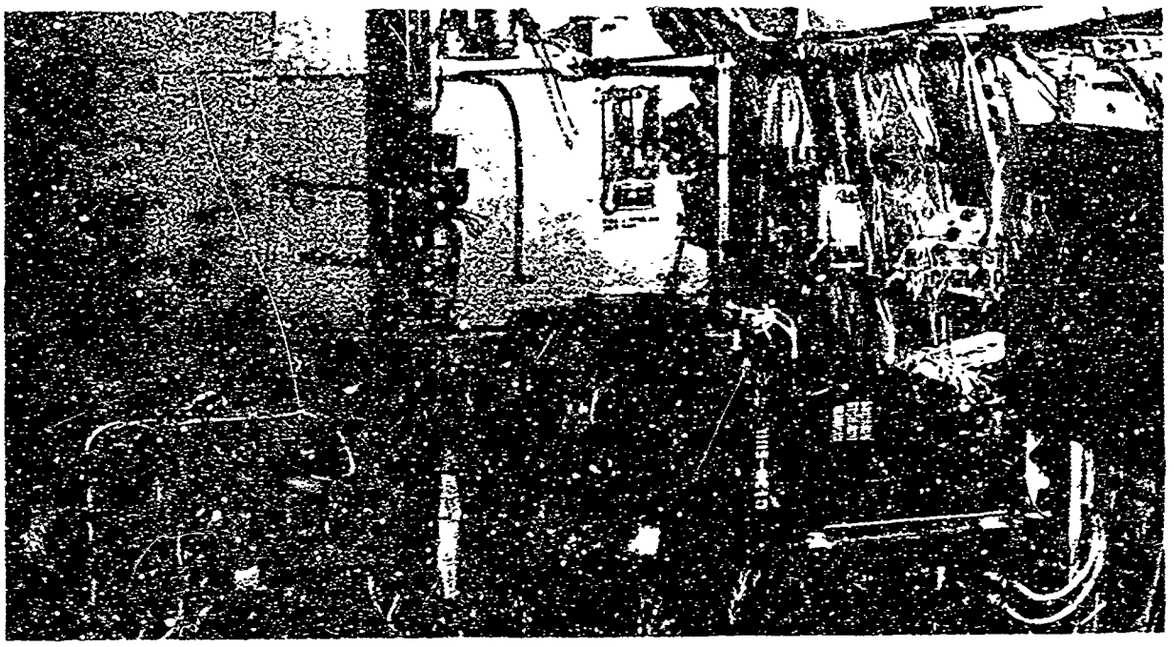


Figure 6 DATA RECORDING EQUIPMENT IN THE AIRPLANE



Figure 8 VARIABLE-RESTRAINT LOCK SETTING SCALE

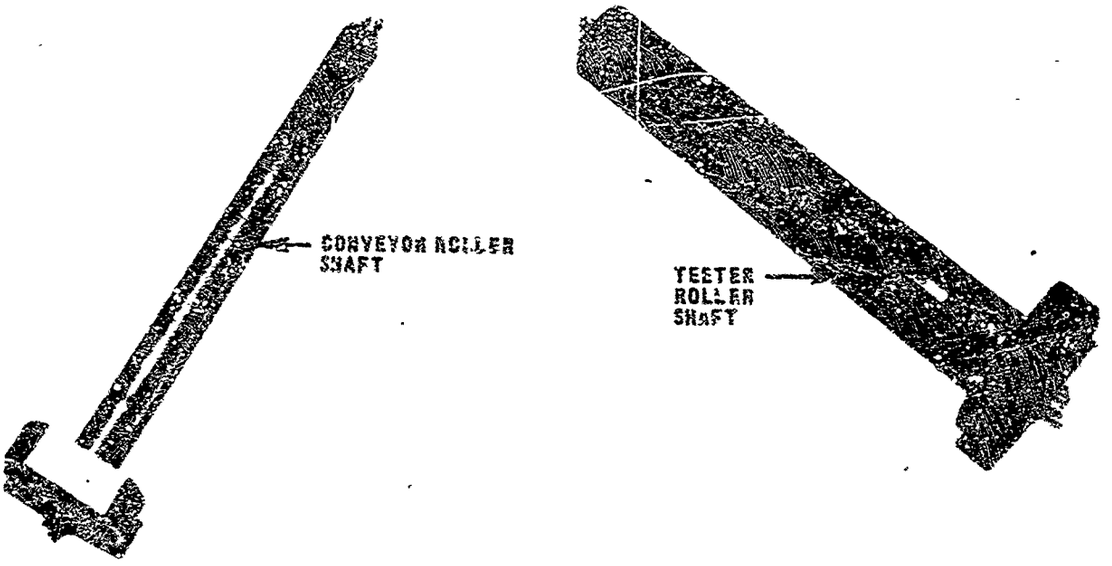


Figure 7 SPECIALLY INSTRUMENTED ROLLER SHAFTS

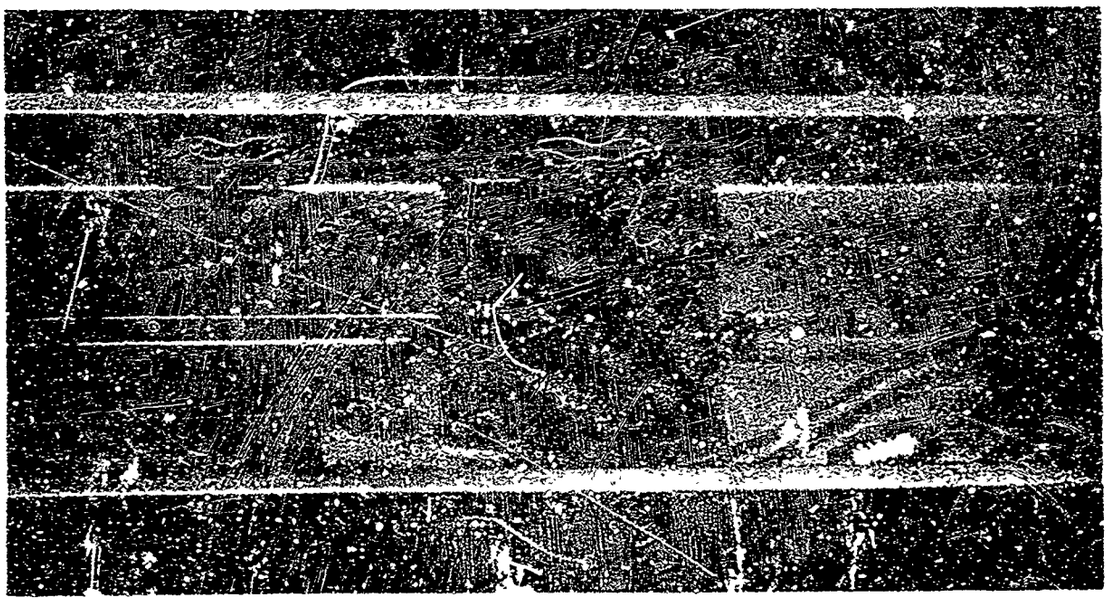


Figure 8 SIDE LOAD STRAIN GAGE MOUNTED ON THE CONVEYOR FRAME RAIL

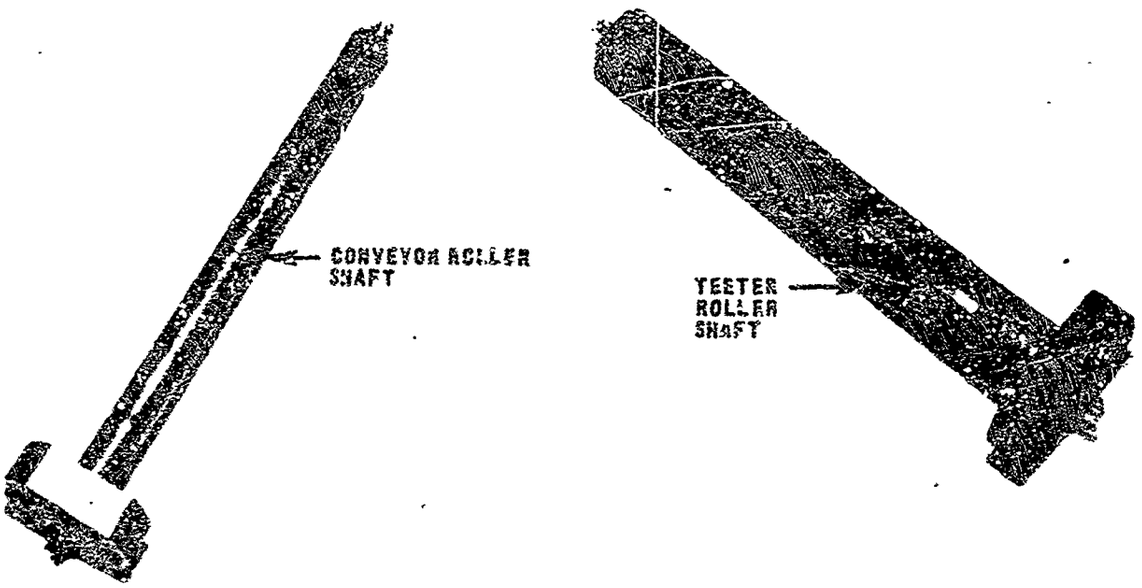


Figure 7 SPECIALLY INSTRUMENTED ROLLER SHAFTS

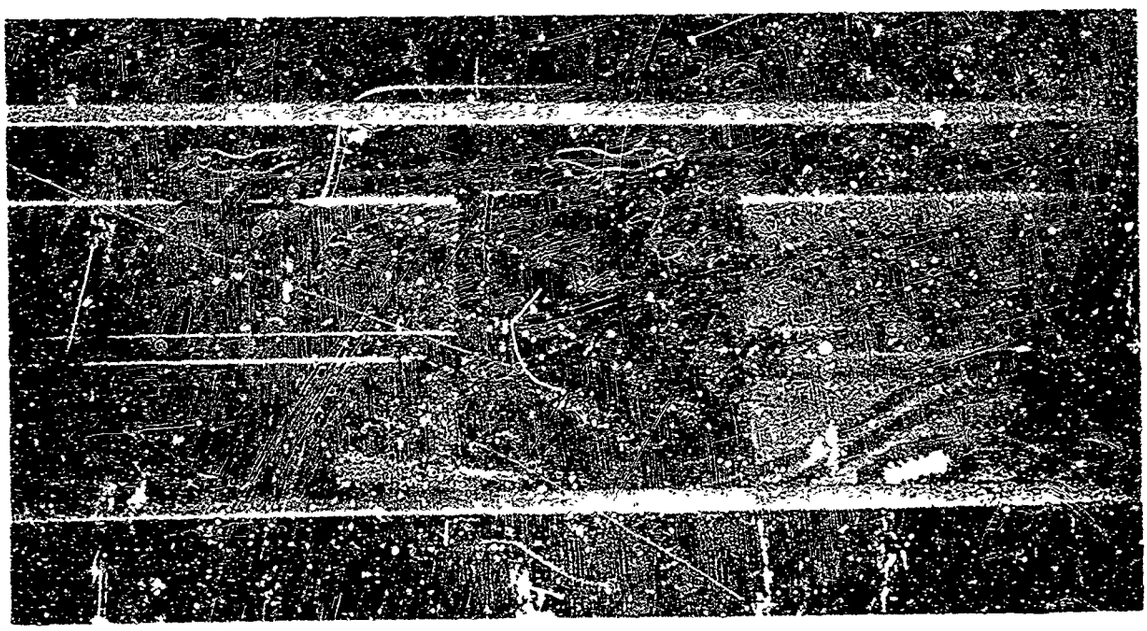


Figure 8 SIDE LOAD STRAIN GAGE MOUNTED ON THE CONVEYOR FRAME RAIL

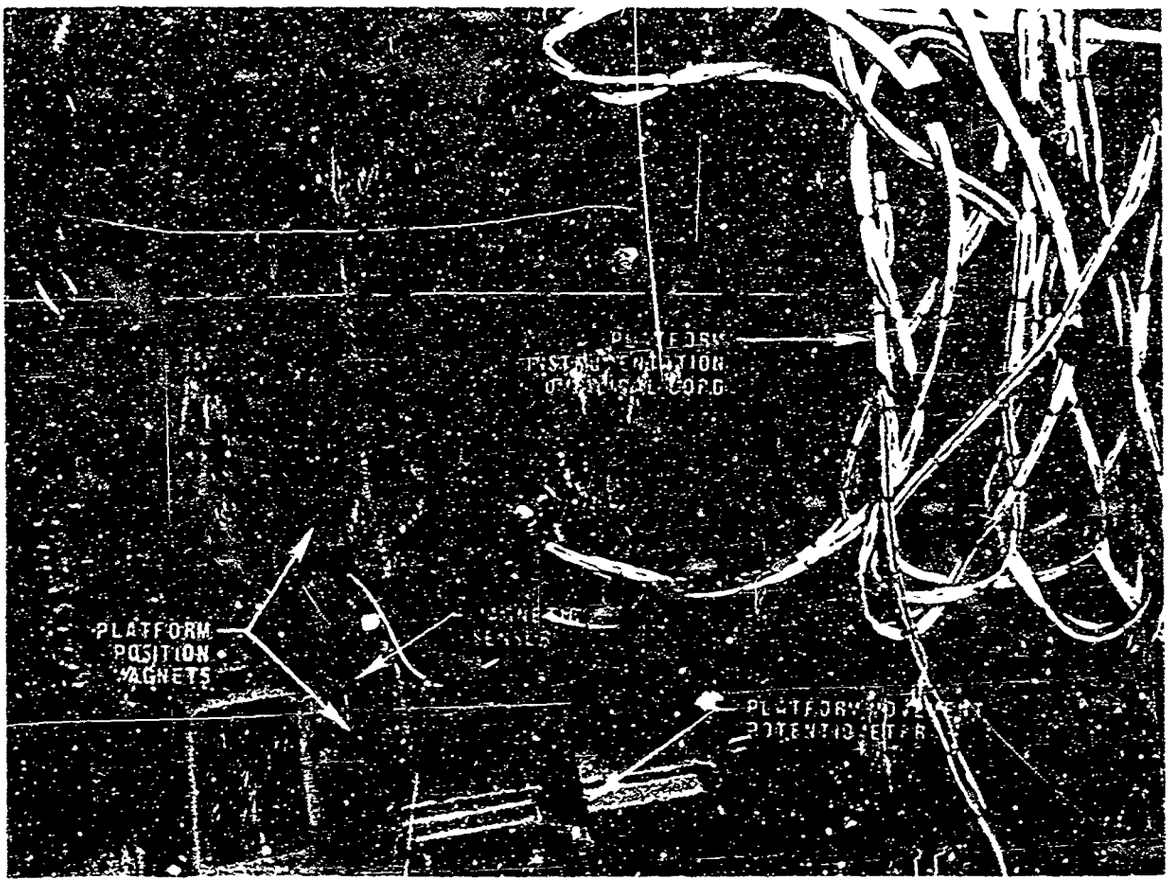


Figure 9 PLATFORM MOVEMENT AND POSITION PICKUPS

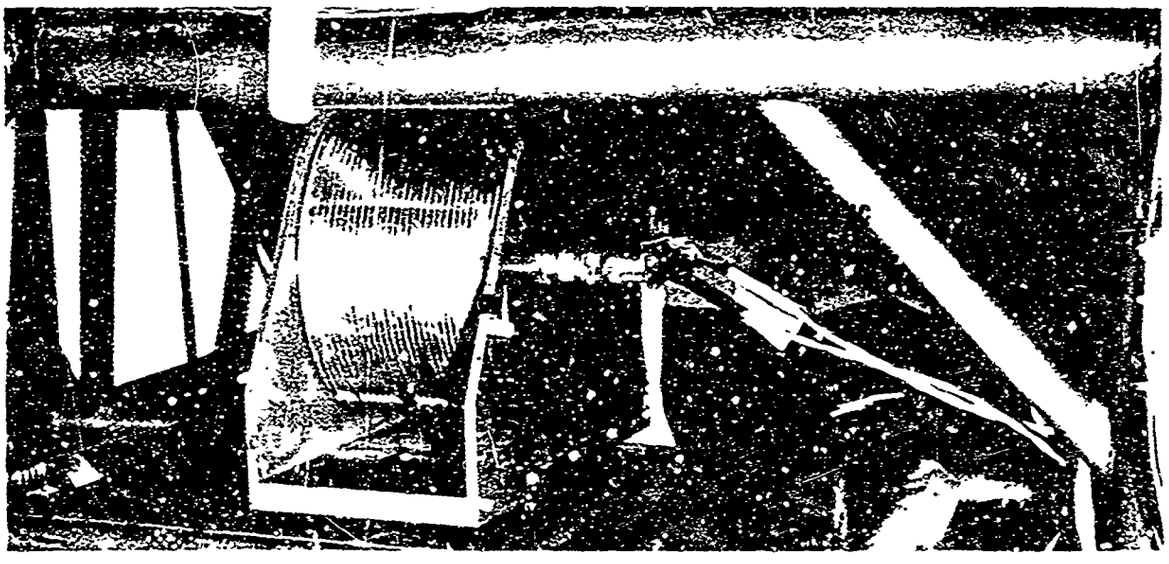


Figure 10 PLATFORM VELOCITY MEASURING REEL

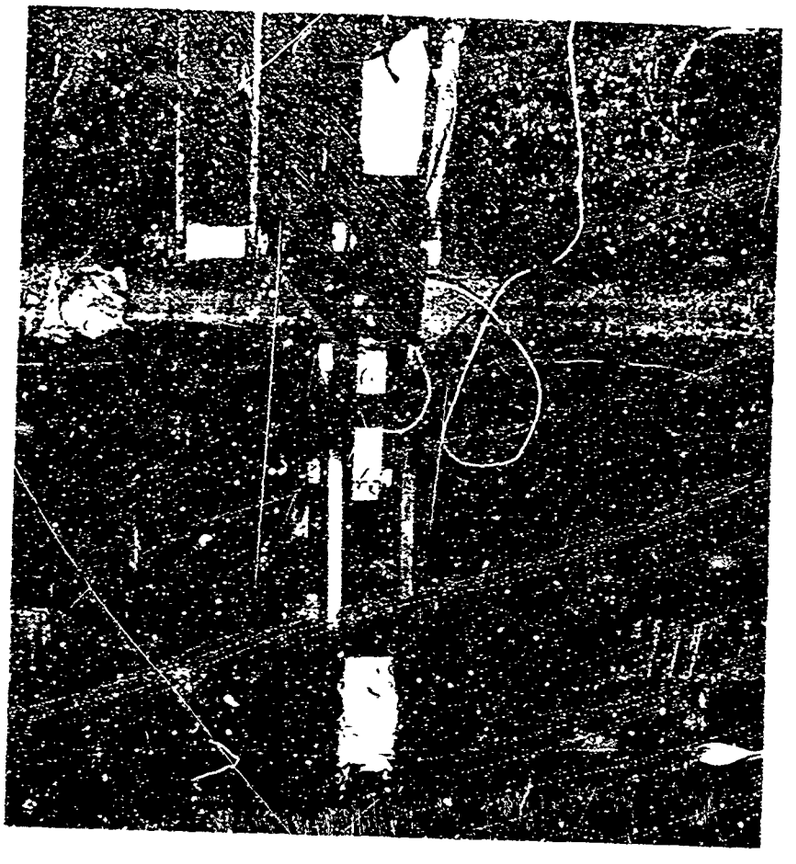


Figure 11
EXTRACTION FORCE
DATA PICKUP

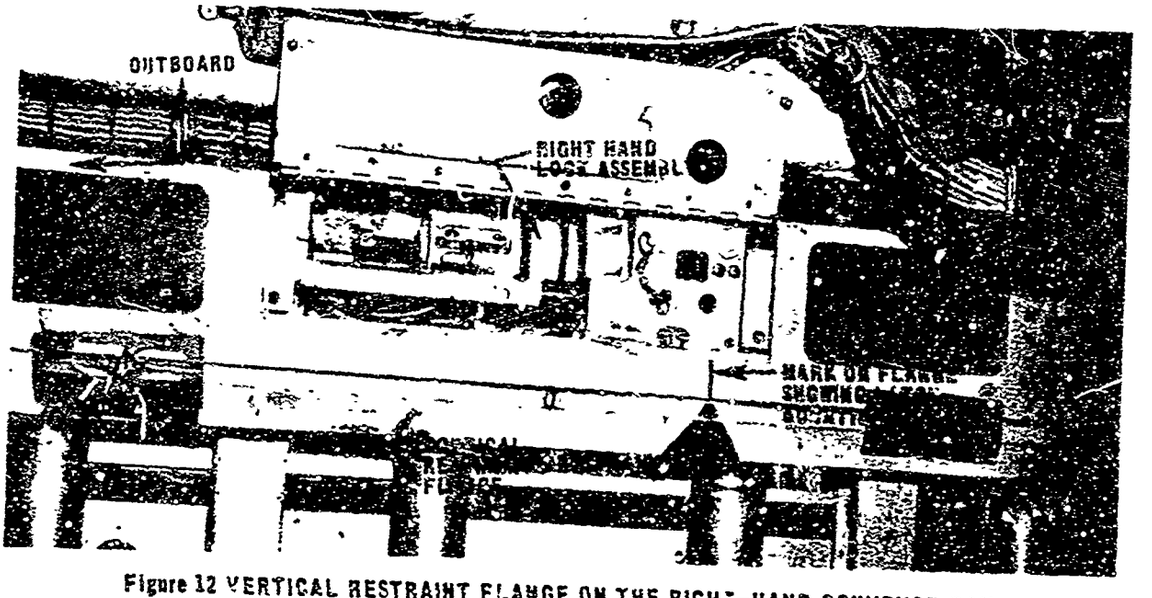


Figure 12 VERTICAL RESTRAINT FLANGE ON THE RIGHT-HAND CONVEYOR RAIL

APPENDIX III

LOCK CALIBRATION PROCEDURES

INTRODUCTION

The purpose of this appendix is to describe the methods used in calibrating the variable-restraint locks for use in the LAPES and GPES extraction tests, and to completely outline the proper lock assembly adjustment and calibration procedures as determined from experience gained during the lock calibrations.

The variable-restraint locks were completely disassembled to allow installation of strain gauges used to obtain latch release forces during load extraction. After strain gauge installation, the lock assemblies were reassembled and calibrated for the full range of latch restraint force. Proper calibration and adjustment of the variable-restraint locks was critical. Unless proper lock

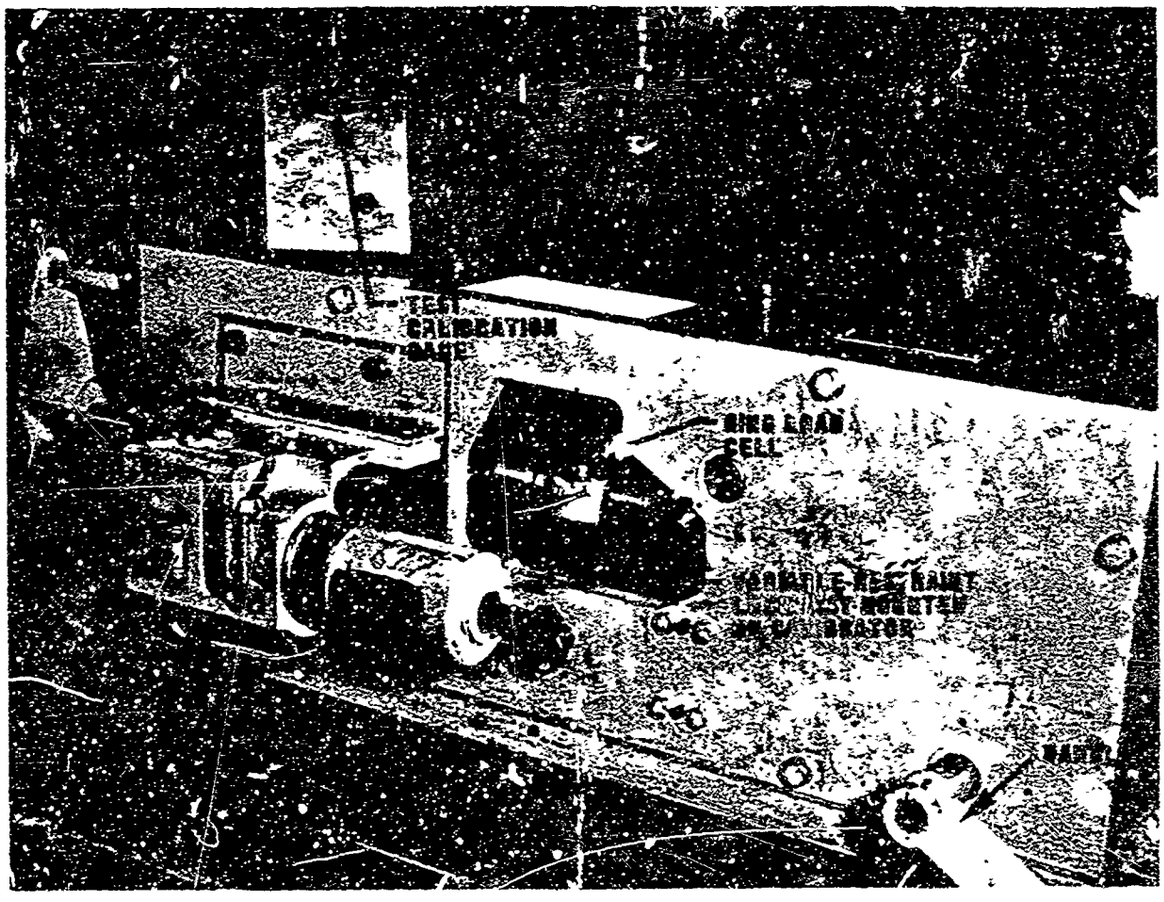


Figure 1 LOCK CALIBRATOR AND TEST INSTRUMENTS

mechanism adjustment was made a repeatable calibration of latch release force could not be maintained.

The calibrator, shown in figure 1 and identified as a Right-Hand Restraint, Detent Latch Assembly Calibrator (Part No. 1017-200) was designed and built by Brooks & Perkins, Inc., Detroit, Michigan, under contract AF 33(657)-14076. The calibrator was intended for use at depot level to permit proper calibration of the variable-restraint locks after adjustment, disassembly, repair and/or parts replacement has been accomplished. The calibrator was designed to test the latches through the full restraint range and to give a visual indication of force at the moment the latch released. Major components of the calibrator assembly were two load cells to indicate applied force; the calibrator assembly housing; a gear drive train for force application to the latch; and a handle for manual force application through the gear train. The load cell dials were marked to indicate force readings at 250, 1000, 2000, 3000, and 4000 pounds. A shaded area on each side of the marked increment signified a 5-percent tolerance (figure 2) of the lock preload scale setting. The lock assembly was considered calibrated if the load cell dial pointer fell within the tolerance range for the applied preload setting at latch release.

METHOD OF CALIBRATION

The load cell provided with the calibrator was not considered adequate to calibrate the locks for test purposes. To provide better force resolution for the instrumented lock assembly calibrations, a ring load cell to replace the load cells in the lock calibrator was fabricated, instrumented and calibrated by the

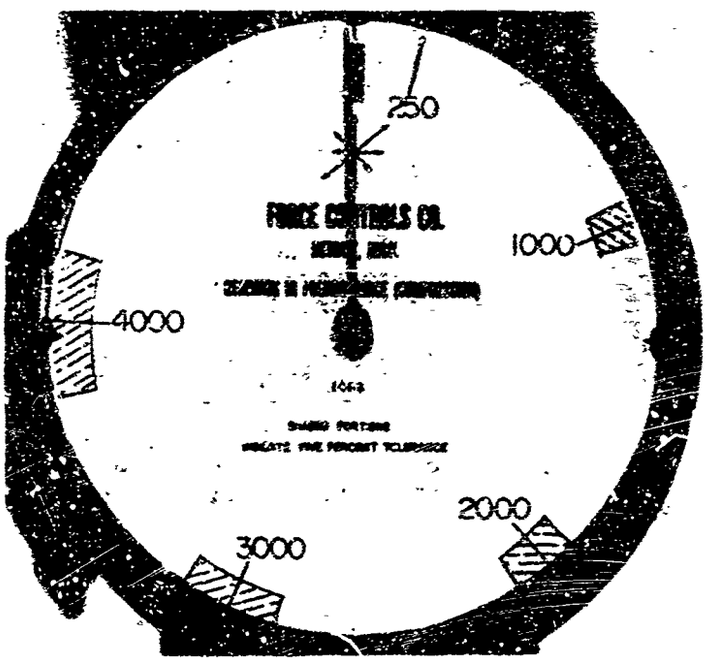


Figure 2
LOCK CALIBRATOR
LOAD CELL DIAL

AFFTC. This device was calibrated to indicate applied force readings in the range of 100 to 4500 pounds. A dial indicator provided force resolution in 10-pound increments. Each lock assembly was calibrated within the 5-percent tolerance range for each lock setting as follows:

Table I

LOCK ASSEMBLY CALIBRATION TOLERANCES

Lock Setting	Release Force	Tolerance Range
1.0	1000 lb	±50 lb
1.5	1500 lb	±75 lb
2.0	2000 lb	±100 lb
2.5	2500 lb	±125 lb
3.0	3000 lb	±150 lb
3.5	3500 lb	±175 lb
4.0	4000 lb	±200 lb

Initial attempts at calibrating the variable-restraint locks were unsuccessful due to an incomplete set of calibration instructions and two discrepancies on the lock calibrator. The following discrepancies were corrected at the AFFTC with the help of a manufacturer's representative.

1. The slot on the calibrator face plate was too short and allowed the latch cam assembly to butt against the aft edge of the slot when the lock assembly was installed on the calibrator. This prevented proper lock mechanism adjustment and resulted in nonrepeating latch release force data. The slot in the calibrator face plate was lengthened approximately 1/16 inch which corrected the discrepancy. Subsequent lock calibrators should be checked to assure that this slot is properly sized. (R 1)

2. The latch cam assembly bottomed against the calibrator force yoke, preventing proper lock mechanism adjustment. Shims, consisting of 3/32-inch metal washers, were installed between the calibrator face plate and the lock mounting flange plate on each of the four attachment bolts. This corrected the discrepancy.

These corrections allowed proper adjustment and calibration of the lock assemblies. Calibrator drawings and manufacturing procedures should be checked to assure that these discrepancies have been corrected. (R 2)

The following paragraph contains a recommended step by step procedure for adjustment and calibration of the A/A32H-4 DRCHS variable-restraint locks with the Brooks & Perkins lock calibrator. This procedure is based on experience gained in lock calibrations accomplished at the AFFTC. It is important that the step-by-step procedures listed be followed if proper lock calibration is to be achieved. The instructions provided with each lock calibrator should be definitive and precise enough to allow proper lock calibration at the depot level. (R 3)

In following the lock calibration procedures outlined below, refer to figure 3.

Installation of Lock Assembly on the Calibrator:

1. Install lock assembly on the calibrator face plate with the four mounting bolts.

2. Tighten top bolts before securing the bottom bolts.

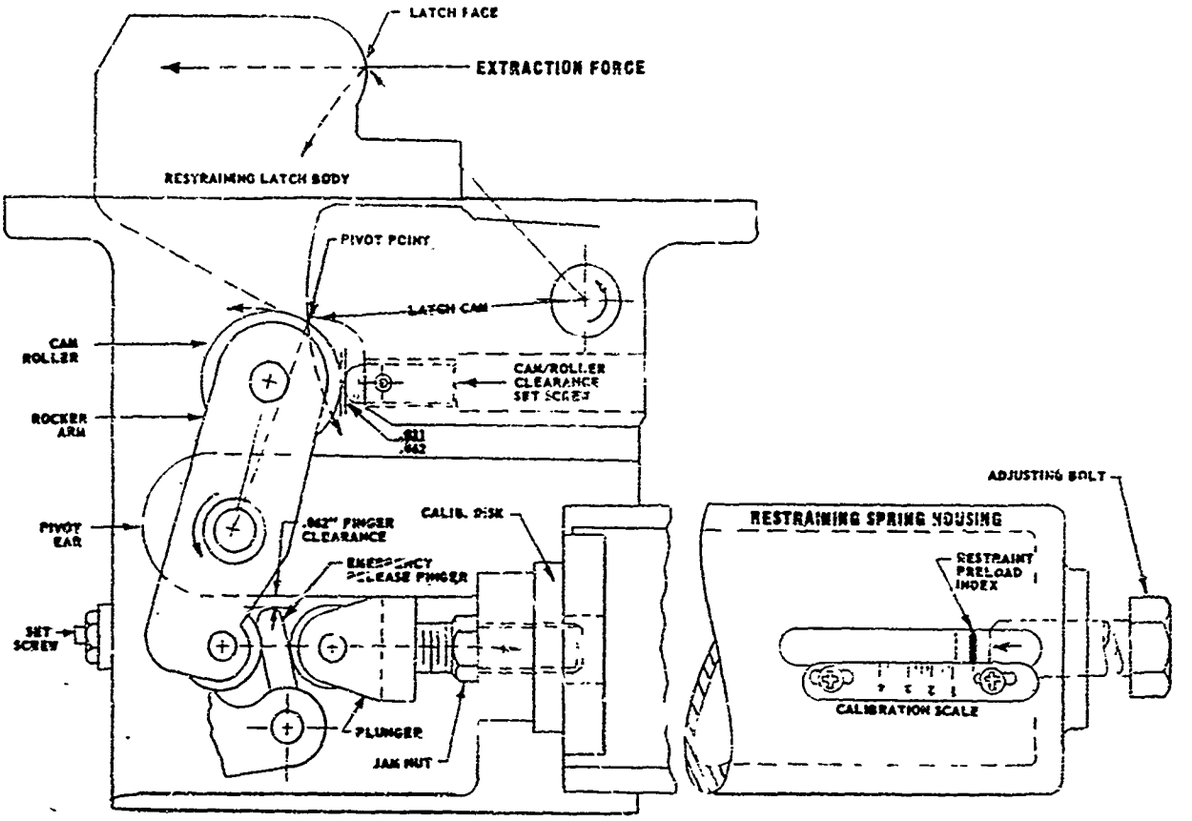


Figure 3 A/A32H-4 VARIABLE-RESTRAINT LOCK MECHANISM

3. Check to see that the latch spring is against the calibrator faceplate and not in the latch slot.

Preadjustment and Checks:

1. Adjust the clearance between the emergency release finger and the lock body by use of the finger adjusting screw. Clearance should be 1/16 inch.

2. Set the 3/8-inch diameter cam roller clearance set screw so that 3-4 threads are exposed. Do not lock the set screw at this time.

3. Turn calibration disc to allow a clearance of 1/32 - 1/16 inch between the cam roller and the cam roller clearance set screw. THIS CLEARANCE IS IMPORTANT TO PROPER LOCK CALIBRATION.

Calibration Procedure:

1. Turn adjusting bolt until the index mark is at a point approximately in the middle of the calibration scale slot on the restraining spring housing barrel (approximately 3000-pound point).

2. Rotate load cell to the outboard position.

3. Cycle lock 6 to 8 times by pulling the calibrator handle until the indicated force decreases to wear in

the latch cam with the cam roller. Do not pull handle far enough to trip the latch. If this happens, hold the drawbar and run the adjusting bolt out until there is no force on the lock preload spring, then release the draw bar. Return the spring index mark to the approximately 3000-pound position.

4. Recheck the clearance between the cam roller and the cam/roller clearance set screw. Cam wear-in and slippage may allow this clearance to increase. Adjust with the calibration disc.

5. Set the calibration scale on the lock and line up the 3.0 mark on the scale with the index mark on the lock preload spring. Do not tighten scale hold-down screws at this time.

6. Return spring index mark to zero, then set at 3.0.

7. Apply a load to the latch and check the release load on the load cell dial. If the release force is above 3000 pounds, turn the calibration disc counter-clockwise to decrease force. If the release force is below 3000 pounds, turn the calibration disc clockwise to increase force.

8. Return spring index mark to zero, then return to 3.0 mark. Check the release force. Readjust calibration disc as necessary and repeat the procedure until the release force falls within the 3000-pound tolerance band. Always tighten the jam nut on the calibration disc before checking the release force.

CAUTION: Be careful not to let the latch cam go over the release point when checking load settings. If this happens, hold the drawbar and return the preload spring index mark to zero, then release the drawbar.

9. Return spring index mark to zero, then set at 1.0 and check the release force. Set the mark to 2.0 and check the release force. Be sure the calibration disc is locked with jam nut when making these checks.

10. If the readings at 1.0 and 2.0 are both high or are both low, adjust the scale position up or down as necessary. Return the index mark to zero, then return to the 1.0 and 2.0 marks, checking the release force at each increment. Continue this procedure, adjusting the calibration disc as necessary until the force indication at the 1.0 and 2.0 marks is within the tolerance band. It may be necessary to set the 3.0 mark at the upper tolerance limit to bring the 1.0 and 2.0 settings within their tolerance bands.

NOTE: Always return the spring index mark to zero before repeating a check at the same index setting. Succeeding checks will always read lower if the index is not returned to zero between readings. Always check settings by proceeding up the scale, not down.

11. When final calibration is complete, find the index scale setting which results in an approximate 500 pound latch release and scribe a mark on the scale.

Final Check:

1. With index mark at 0.50 or above, recheck the clearance

between the cam roller and the cam/roller clearance set-screw. Clearance should be between 1/16 and 1/32 inch. Adjust by turning the clearance set screw as necessary. When clearance is set, tighten the locking screw.

2. Check to see that calibration disc jam nut is tight. Tighten if necessary, making sure that the calibration disc does not move.

3. Secure the lock scale with the two hold-down screws.

RECOMMENDATIONS

1. The latch slot in the lock calibrator faceplate should be lengthened to allow proper movement and clearance of the latch when the lock is mounted on the calibrator.

2. Spacers should be provided on the lock calibrator faceplate to allow proper latch to force yoke clearance with the lock mounted on the calibrator.

3. Instructions provided with each lock calibrator should be definitive and precise enough to allow personnel at depot level to adjust and calibrate the variable-restraint locks by following step-by-step procedures.

4. Step-by-step procedures for the calibration of the variable-restraint lock release should be followed diligently to assure that proper adjustment and calibration is achieved.

APPENDIX IV

TEST DATA CORRECTED FOR INSTRUMENT ERROR

TEST DATA CORRECTED FOR INSTRUMENT ERROR

C-130E S/N 64-0560
T56-A-7 Engines 54H60-91 Propellers
Airplane Weight 90 000 lb Cruise Configuration
Four Engines Operating

LEVEL FLIGHT ENGINE DATA
Flight 13B 18 March 1966

Point		1	2	3	4	5
Counter (sec)		300	424	687	1094	1320
Airspeed (kt)		264	255.5	240	205	189
Altitude (ft)		14 380	14 530	14 490	14 600	14 490
Free Air Temp (deg C)		+8.6	+7.6	+6.7	+2.7	+1.3
Engine Torque (in/lb)	(1)	14 750	13 550	11 200	8 100	7 000
	(2)	14 650	13 500	11 200	8 050	7 050
	(3)	14 900	13 700	11 350	8 300	7 000
	(4)	14 700	13 450	11 050	8 050	7 050
Engine T_{T_5} (deg C)	(1)	971	932	850	750	700
	(2)	971	932	850	750	700
	(3)	971	932	850	750	700
	(4)	971	932	850	750	700
Engine Speed(pct rpm) (uncorrected production instrument)	(1)	100	100	100	100	100
	(2)	100	100	100	100	100
	(3)	100	100	100	100	100
	(4)	100	100	100	100	100

TEST DATA CORRECTED FOR INSTRUMENT ERROR

C-130E S/N 64-0560
T56-A-7 Engines 54H60-91 Propellers
Four Engines Operating

SAWTOOTH CLIMB
Flight 80 14 July 1966

Gear Down, Flaps 70 Pct, Ramp and Ramp Door Open
One 15-Ft D_e Drogue Parachute Attached to Ramp with 60-Ft Line

Point		1	2	3	4	5	6
Mag Heading		180	360	360	180	180	180
Time (sec)		561	771	1086	1308	1483	1604
Airspeed (kt)		116.5	116.0	129.0	131.7	121.3	141.0
Altitude (ft)		2025	2025	2025	2025	2025	2025
Free Air Temp (deg C)		+36.7	+36.7	+35.4	+35.9	+36.5	+38.5
Airplane Weight (lb)		132 800	132 000	131 000	130 600	129 900	129 200
Engine Speed (pct rpm) (uncorrected production instruments)	(1)	100	100	100	100	100	100
	(2)	100	100	100	100	100	100
	(3)	100	100	100	100	100	100
	(4)	100	100	100	100	100	100
Engine Torque (in./lb)	(1)	14 600	14 700	14 900	15 000	14 850	14 850
	(2)	14 450	14 400	14 650	14 700	14 550	14 450
	(3)	14 800	14 750	15 000	15 700	14 900	14 900
	(4)	14 700	14 650	14 950	15 050	14 900	14 900
Engine T_{t_5} (deg C)	(1)	968	968	962	975	968	971
	(2)	953	953	950	950	952	951
	(3)	958	955	952	955	955	958
	(4)	960	962	958	960	961	962

C-130E S/N 64-0560
SPACE POSITIONING DATA
DURING LAPES AND GPES TESTS

The following space positioning data are one station solutions obtained from a portable phototheodolite. The object tracked was the left rear main landing gear of the test airplane. The number written beside the time printout is the time that corresponds with time zero on the time history plots in the appendix I.

Data are presented only for the flights from which descent or climbout information was obtained.

25-APR-66 NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 894 FLT 32

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-5.003	1267.7	0.0	61.1	-2.9	126.1
*	-4.753	1215.1	0.0	60.9	-3.3	126.1
*	-4.503	1162.0	0.0	60.0	-4.3	126.3
*	-4.253	1108.0	0.0	58.5	-5.6	126.3
*	-4.003	1055.2	0.0	57.5	-7.1	126.4
*	-3.753	1001.7	0.0	55.4	-9.3	126.5
*	-3.503	948.3	0.0	52.7	-11.8	126.7
*	-3.253	895.4	0.0	50.2	-14.4	127.2
*	-3.003	841.8	0.0	45.5	-16.5	127.5
*	-2.753	787.6	0.0	40.8	-18.2	127.9
*	-2.503	733.7	0.0	36.1	-19.3	128.6
*	-2.253	680.0	0.0	31.1	-18.1	128.7
*	-2.003	626.1	0.0	26.1	-17.3	128.8
*	-1.753	570.7	0.0	21.2	-15.8	129.0
*	-1.503	517.3	0.0	19.5	-13.6	129.1
*	-1.253	462.6	0.0	14.7	-10.9	128.8
*	-1.003	408.1	0.0	12.4	-8.8	128.8
*	-0.753	353.9	0.0	10.7	-7.6	129.4
*	-0.503	300.3	0.0	10.0	-5.5	129.6
*	-0.253	244.7	0.0	8.3	-4.3	129.0
*	-0.003	189.3	0.0	6.9	-3.3	128.2
*	0.247	134.5	0.0	6.5	-2.5	127.6
*	0.497 0.596	83.7	0.0	6.3	-1.5	127.1
*	0.747	30.1	0.0	6.1	-1.0	127.3
*	0.997	-23.0	0.0	5.8	-1.0	128.4
*	1.247	-78.7	0.0	5.5	-1.1	130.4
*	1.497	-134.0	0.0	5.3	-1.1	131.8
*	1.747	-189.9	0.0	5.0	-1.1	133.3
*	1.997	-246.5	0.0	4.7	-0.7	133.8
*	2.247	-303.7	0.0	4.4	0.6	133.8
*	2.497	-361.6	0.0	4.2	2.6	133.2
*	2.747	-415.8	0.0	4.7	4.0	132.3
*	2.997	-471.8	0.0	7.1	5.1	131.0
*	3.247	-527.0	0.0	9.3	5.9	130.5
*	3.497	-581.6	0.0	9.8	6.1	130.5
*	3.747	-633.7	0.0	11.1	6.3	130.4
*	3.997	-692.2	0.0	12.9	7.2	131.4
*	4.247	-746.5	0.0	14.5	9.2	132.7
*	4.497	-802.0	0.0	17.4	11.8	133.7
*	4.747	-860.4	0.0	20.0	13.9	134.3
*	4.997	-917.5	0.0	23.8	16.6	135.0

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 894 25-APR-66 STA 02

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	5.247	-973.2	0.0	29.7	18.8	135.0
*	5.497	-1030.4	0.0	33.1	21.4	134.7
*	5.747	-1087.0	0.0	39.5	23.7	134.9
*	5.997	-1143.1	0.0	45.2	25.9	135.5
*	6.247	-1200.1	0.0	52.4	28.6	135.7
*	6.497	-1257.1	0.0	60.0	30.2	135.9
*	6.747	-1314.4	0.0	67.9	32.1	136.3
*	6.997	-1371.0	0.0	76.0	33.5	136.4
*	7.247	-1427.6	0.0	84.1	34.8	136.7
*	7.497	-1485.1	0.0	93.6	35.5	137.0
*	7.747	-1542.0	0.0	102.8	36.3	137.3
*	7.997	-1599.7	0.0	112.1	37.0	137.3
*	8.247	-1657.1	0.0	120.6	36.9	137.4
*	8.497	-1713.6	0.0	130.3	36.3	137.5
*	8.747	-1770.6	0.0	140.0	36.0	137.7
*	8.997	-1828.8	0.0	148.7	36.0	138.0
*	9.247	-1886.2	0.0	156.5	36.1	138.4
*	9.497	-1944.4	0.0	166.0	36.4	138.3
*	9.747	-2001.6	0.0	175.4	37.3	138.4
*	9.997	-2059.8	0.0	185.3	38.5	138.3
*	10.247	-2116.2	0.0	194.2	38.6	138.4
*	10.497	-2174.9	0.0	204.3	38.8	138.5
*	10.747	-2231.6	0.0	214.6	38.3	138.3
*	10.997	-2290.1	0.0	223.5	37.7	138.1
*	11.247	-2347.5	0.0	233.5	36.4	137.7
*	11.497	-2404.4	0.0	241.9	35.5	137.6
*	11.747	-2461.3	0.0	250.7	34.8	137.6
*	11.997	-2519.1	0.0	259.1	34.1	137.7
*	12.247	-2576.6	0.0	267.9	33.9	138.4
*	12.497	-2635.0	0.0	276.0	33.1	138.4
*	12.747	-2691.9	0.0	284.7	32.6	138.1
*	12.997	-2751.4	0.0	292.6	31.6	137.9
*	13.247	-2807.6	0.0	300.1	30.8	137.6
*	13.497	-2864.8	0.0	308.3	30.8	137.6
*	13.747	-2923.1	0.0	315.1	30.8	137.7
*	13.997	-2980.4	0.0	322.3	30.7	138.3
*	14.247	-3037.9	0.0	331.9	31.9	138.4
*	14.497	-3096.7	0.0	338.6	33.5	138.5
*	14.747	-3154.6	0.0	345.9	34.4	139.0
*	14.997	-3211.7	0.0	356.8	34.4	139.2
*	15.247	-3270.0	0.0	365.6	35.3	139.5
*	15.497	-3328.8	0.0	374.0	34.5	140.0
*	15.747	-3386.8	0.0	382.0	33.3	140.4
*	15.997	-3445.8	0.0	391.1	32.6	140.5
*	16.247	-3505.0	0.0	398.0	31.8	140.6
*	16.497	-3563.6	0.0	407.2	30.9	140.5
*	16.747	-3622.2	0.0	414.2	30.4	140.2
*	16.997	-3681.6	0.0	421.3	31.0	140.3

27-APR-66 NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 964 FLT 84

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-5.227	1202.8	0.0	56.8	-2.2	129.3
*	-4.977	1148.2	0.0	55.1	-4.3	129.5
*	-4.727	1093.3	0.0	54.5	-5.5	129.8
*	-4.477	1038.6	0.0	52.5	-7.8	130.2
*	-4.227	983.8	0.0	49.7	-9.4	130.3
*	-3.977	928.2	0.0	49.0	-13.8	128.9
*	-3.727	873.4	0.0	44.3	-14.6	129.8
*	-3.477	818.9	0.0	41.1	-15.0	130.6
*	-3.227	770.0	0.0	31.8	-15.3	131.6
*	-2.977	707.6	0.0	33.0	-14.7	132.6
*	-2.727	652.2	0.0	29.4	-14.5	133.6
*	-2.477	595.8	0.0	25.9	-13.2	134.2
*	-2.227	540.1	0.0	20.8	-14.9	133.6
*	-1.977	484.5	0.0	17.0	-14.4	132.7
*	-1.727	428.5	0.0	14.6	-13.2	132.6
*	-1.477	372.9	0.0	11.0	-11.6	132.8
*	-1.227	316.5	0.0	7.7	-10.4	132.9
*	-0.977	260.6	0.0	5.9	-9.8	133.2
*	-0.727	204.3	0.0	3.3	-8.4	133.5
*	-0.477	148.6	0.0	2.0	-6.9	133.7
*	-0.227	91.4	0.0	-0.6	-5.0	133.5
*	0.023	34.9	0.0	-1.8	-2.5	133.5
*	0.273 (0.157)	-21.6	0.0	-1.9	-0.4	133.6
*	0.523	-76.5	0.0	-1.1	1.1	133.2
*	0.773	-133.8	0.0	-0.0	1.8	133.3
*	1.023	-190.3	0.0	0.4	1.6	133.4
*	1.273	-245.7	0.0	-0.1	1.8	133.7
*	1.523	-302.5	0.0	0.7	2.6	133.9
*	1.773	-358.9	0.0	0.7	3.9	134.0
*	2.023	-415.7	0.0	2.4	2.1	131.9
*	2.273	-473.0	0.0	4.3	3.5	133.1
*	2.523	-528.7	0.0	5.9	4.1	134.1
*	2.773	-576.5	0.0	0.1	3.3	135.3
*	3.023	-643.7	0.0	8.2	2.4	136.2
*	3.273	-700.3	0.0	7.9	2.2	137.8
*	3.523	-758.4	0.0	6.9	2.8	112.6
*	3.773	-814.8	0.0	6.6	-0.2	119.3
*	4.023	-874.1	0.0	7.0	1.1	128.6
*	4.273	-828.0	0.0	7.7	3.2	138.1
*	4.523	-989.9	0.0	7.8	5.6	147.4
*	4.773	-1048.1	0.0	9.5	7.6	156.3
*	5.023	-1108.0	0.0	12.1	10.2	165.7
*	5.273	-1165.8	0.0	15.5	13.3	140.0
*	5.523	-1224.9	0.0	18.1	16.3	140.2
*	5.773	-1284.3	0.0	22.7	19.3	140.2
*	6.023	-1343.9	0.0	27.9	21.6	140.4
*	6.273	-1402.0	0.0	34.6	24.0	140.5
*	6.523	-1461.3	0.0	41.3	25.5	140.5
*	6.773	-1519.6	0.0	46.5	27.9	140.9
*	7.023	-1579.6	0.0	53.8	30.1	141.3
*	7.273	-1638.2	0.0	61.0	32.7	141.4
*	7.523	-1698.0	0.0	71.2	35.4	141.5

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 964APR-66 STA 82 TIME

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	7.773	-1756.6	0.0	80.0	37.9	141.4
*	8.023	-1815.3	0.0	89.4	39.7	141.6
*	8.273	-1874.2	0.0	99.0	39.6	141.6
*	8.523	-1933.0	0.0	110.7	40.0	141.7
*	8.773	-1992.4	0.0	120.9	40.0	141.7
*	9.023	-2051.5	0.0	129.3	39.7	141.7
*	9.273	-2110.0	0.0	139.5	39.0	141.3
*	9.523	-2168.9	0.0	149.6	38.5	141.2
*	9.773	-2227.9	0.0	159.5	38.8	143.3
*	10.023	-2285.8	0.0	169.2	39.1	142.9
*	10.273	-2345.6	0.0	177.3	38.9	141.9
*	10.523	-2412.7	0.0	188.1	39.6	141.3
*	10.773	-2463.7	0.0	199.1	40.3	140.8
*	11.023	-2520.7	0.0	207.8	40.9	139.2
*	11.273	-2580.6	0.0	218.8	35.0	137.4
*	11.523	-2639.4	0.0	229.0	35.8	138.9
*	11.773	-2695.2	0.0	238.8	37.4	138.5
*	12.023	-2753.8	0.0	236.1	36.9	137.9
*	12.273	-2810.8	0.0	257.0	38.8	138.2
*	12.523	-2867.5	0.0	267.3	40.9	138.8
*	12.773	-2926.0	0.0	273.4	43.1	139.1
*	13.023	-2984.4	0.0	286.2	37.9	138.8
*	13.273	-3041.3	0.0	295.3	38.0	138.8
*	13.523	-3099.6	0.0	304.8	38.9	138.5
*	13.773	-3157.2	0.0	313.1	36.5	122.1
*	14.023	-3214.4	0.0	323.1	35.2	126.9
*	14.273	-3271.8	0.0	333.6	36.2	131.8
*	14.523	-3265.6	0.0	339.8	37.4	137.0
*	14.773	-3385.3	0.0	347.3	37.9	142.4
*	15.023	-3442.5	0.0	361.0	37.5	147.4
*	15.273	-3499.9	0.0	370.7	38.9	152.4
*	15.523	-3557.0	0.0	379.8	38.5	136.7
*	15.773	-3613.1	0.0	386.6	33.7	136.4
*	16.023	-3668.7	0.0	398.2	35.8	137.1
*	16.273	-3727.5	0.0	407.1	37.1	136.7
*	16.523	-3785.1	0.0	409.2	38.2	137.4
*	16.773	-3843.1	0.0	427.9	36.9	137.2
*	17.023	-3896.3	0.0	435.1	37.4	136.7
*	17.273	-3956.6	0.0	444.1	37.8	137.0
*	17.523	-4012.3	0.0	451.1	34.4	137.1
*	17.773	-4069.5	0.0	461.0	35.2	138.4
*	18.023	-4127.8	0.0	470.1	35.8	138.2
*	18.273	-4185.2	0.0	479.2	36.4	138.8

28-APR-66 NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 965 FLT 35

#	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
#	-5.186	1126.2	0.0	47.8	-7.9	121.1
#	-4.936	1075.2	0.0	46.3	-9.1	121.3
#	-4.686	1023.9	0.0	42.7	-10.4	121.3
#	-4.436	972.9	0.0	40.1	-10.8	121.6
#	-4.186	921.7	0.0	37.6	-11.5	122.0
#	-3.936	870.3	0.0	34.4	-11.3	122.2
#	-3.686	818.7	0.0	32.2	-11.4	122.6
#	-3.436	766.3	0.0	28.4	-11.7	122.9
#	-3.186	715.3	0.0	25.9	-11.6	123.0
#	-2.936	663.0	0.0	23.3	-11.4	123.1
#	-2.686	611.4	0.0	19.9	-11.2	123.3
#	-2.436	559.5	0.0	17.4	-10.9	123.7
#	-2.186	507.1	0.0	14.8	-10.8	123.8
#	-1.936	454.7	0.0	11.6	-10.4	124.0
#	-1.686	402.6	0.0	9.9	-10.4	124.3
#	-1.436	350.0	0.0	6.6	-9.9	124.4
#	-1.186	298.0	0.0	4.5	-8.8	124.7
#	-0.936	245.0	0.0	1.6	-7.5	124.7
#	-0.686	192.2	0.0	0.2	-5.2	124.7
#	-0.436	139.2	0.0	-0.8	-2.9	124.7
#	-0.186	87.7	0.0	-1.2	-0.8	124.5
#	0.064 0.236	34.4	0.0	-1.0	0.0	124.4
#	0.314	-18.0	0.0	-0.2	0.6	124.4
#	0.564	-70.2	0.0	-0.0	0.7	124.7
#	0.814	-123.0	0.0	-0.5	0.7	124.7
#	1.064	-175.4	0.0	-0.2	1.0	124.9
#	1.314	-228.7	0.0	-0.1	1.2	125.2
#	1.564	-281.2	0.0	0.6	2.4	125.4
#	1.814	-334.0	0.0	1.6	3.5	125.3
#	2.064	-387.2	0.0	1.2	4.1	115.6
#	2.314	-440.5	0.0	3.6	5.1	116.4
#	2.564	-492.4	0.0	5.2	5.2	120.5
#	2.814	-507.7	0.0	5.8	4.9	124.6
#	3.064	-588.8	0.0	8.4	3.7	129.0
#	3.314	-651.8	0.0	8.2	2.9	132.9
#	3.564	-704.9	0.0	8.4	3.0	137.2
#	3.814	-758.6	0.0	9.4	3.1	126.5
#	4.064	-809.6	0.0	9.5	4.7	125.6
#	4.314	-862.2	0.0	11.5	6.8	127.4
#	4.564	-909.8	0.0	12.9	8.9	129.1
#	4.814	-971.2	0.0	15.5	11.8	131.0
#	5.064	-1029.1	0.0	19.0	14.7	132.3
#	5.314	-1084.0	0.0	22.4	13.0	133.5
#	5.564	-1139.3	0.0	27.7	17.0	131.9
#	5.814	-1195.4	0.0	33.6	20.7	132.3
#	6.064	-1250.5	0.0	28.4	23.8	132.9
#	6.314	-1307.2	0.0	45.1	26.7	133.2
#	6.564	-1361.9	0.0	51.9	29.2	133.7
#	6.814	-1418.8	0.0	58.1	32.3	134.5
#	7.064	-1474.1	0.0	65.8	28.8	134.3
#	7.314	-1531.4	0.0	72.6	30.0	134.6
#	7.564	-1587.8	0.0	80.7	31.5	134.7

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 965 82 28-APR-66 TIME

#	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	7.814	-1643.6	0.0	88.3	32.0	135.0
*	8.064	-1699.4	0.0	96.8	32.9	134.9
*	8.314	-1756.4	0.0	105.8	34.2	135.6
*	8.564	-1813.2	0.0	113.1	35.5	136.4
*	8.814	-1869.3	0.0	122.1	36.5	136.9
*	9.064	-1927.6	0.0	132.5	37.5	137.2
*	9.314	-1984.6	0.0	141.9	38.9	137.3
*	9.564	-2041.4	0.0	151.5	39.1	137.8
*	9.814	-2098.9	0.0	161.2	38.9	137.7
*	10.064	-2155.9	0.0	171.3	39.4	138.2
*	10.314	-2214.1	0.0	180.9	39.5	138.6
*	10.564	-2271.3	0.0	190.6	39.3	138.9
*	10.814	-2329.3	0.0	201.2	39.2	138.9
*	11.064	-2387.4	0.0	210.6	37.8	138.4
*	11.314	-2445.4	0.0	220.0	37.9	138.0
*	11.564	-2502.2	0.0	230.1	37.4	137.2
*	11.814	-2559.2	0.0	236.6	37.3	137.0
*	12.064	-2616.1	0.0	249.0	36.8	136.9
*	12.314	-2671.8	0.0	257.2	37.1	137.1
*	12.564	-2730.9	0.0	266.5	37.4	137.0
*	12.814	-2787.8	0.0	274.8	36.1	136.6
*	13.064	-2844.3	0.0	285.4	34.1	136.1
*	13.314	-2900.8	0.0	293.6	33.8	135.6
*	13.564	-2957.1	0.0	302.7	32.0	135.4
*	13.814	-3013.4	0.0	306.4	32.2	135.7
*	14.064	-3071.2	0.0	318.6	32.7	136.1
*	14.314	-3127.1	0.0	323.1	37.8	136.5
*	14.564	-3184.6	0.0	335.6	36.9	136.4
*	14.814	-3241.6	0.0	342.4	33.1	136.0
*	15.064	-3297.5	0.0	361.3	31.1	135.5
*	15.314	-3354.6	0.0	357.7	27.1	134.8
*	15.564	-3412.1	0.0	366.2	25.3	134.7
*	15.814	-3466.6	0.0	371.7	22.6	134.8
*	16.064	-3523.7	0.0	378.4	27.1	135.1
*	16.314	-3580.6	0.0	385.3	26.6	135.3
*	16.564	-3637.7	0.0	390.9	26.0	136.4
*	16.814	-3694.4	0.0	398.6	25.8	136.3
*	17.064	-3751.3	0.0	404.3	25.1	136.5
*	17.314	-3810.6	0.0	410.7	25.3	136.6
*	17.564	-3865.9	0.0	417.2	24.7	136.7
*	17.814	-3924.0	0.0	422.3	24.5	136.8
*	18.064	-3981.3	0.0	429.8	23.5	137.1
*	18.314	-4038.6	0.0	435.3	23.6	137.9
*	18.564	-4095.4	0.0	440.7	23.0	137.9
*	18.814	-4155.8	0.0	445.6	22.3	137.5
*	19.064	-4213.3	0.0	453.1	22.6	137.7
*	19.314	-4270.7	0.0	457.0	22.1	137.3
*	19.564	-4326.7	0.0	463.1	21.7	137.4
*	19.814	-4386.5	0.0	469.2	20.9	137.8
*	20.064	-4443.0	0.0	473.2	20.4	138.0
*	20.314	-4502.5	0.0	478.8	19.3	139.1
*	20.564	-4560.3	0.0	483.9	18.6	139.3

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 965 82 28-APR-66

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TIME TOTAL VELOCITY KNOTS
*	20.814	-4617.7	0.0	487.6	18.3	140.3
*	21.064	-4679.3	0.0	492.4	17.5	139.6
*	21.314	-4737.6	0.0	497.0	17.7	139.7
*	21.564	-4797.3	0.0	501.0	18.5	139.2
*	21.814	-4852.9	0.0	505.3	18.5	138.1

29-APR-66

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 966 FLT 36

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-5.189	979.5	-0.0	34.4	-12.9	126.4
*	-4.939	925.4	-0.0	31.8	-12.8	126.7
*	-4.689	872.5	-0.0	28.3	-10.0	126.9
*	-4.439	819.0	-0.0	25.3	-10.5	127.1
*	-4.189	765.2	-0.0	21.9	-11.7	127.3
*	-3.939	711.7	-0.0	25.2	-12.2	127.7
*	-3.689	657.8	-0.0	16.4	-12.8	128.0
*	-3.439	603.5	-0.0	12.6	-13.1	128.5
*	-3.189	548.9	-0.0	10.1	-12.9	128.7
*	-2.939	495.3	-0.0	7.5	-8.8	128.7
*	-2.689	443.4	-0.0	5.3	-7.2	129.0
*	-2.439	389.8	-0.0	4.1	-6.3	129.2
*	-2.189	332.4	-0.0	3.0	-5.2	129.2
*	-1.939	276.9	-0.0	1.7	-4.3	129.4
*	-1.689	222.8	-0.0	-0.9	-3.6	129.7
*	-1.439	168.3	-0.0	-0.2	-2.6	129.9
*	-1.189	113.2	-0.0	-0.7	-2.0	129.9
*	-0.939	58.5	-0.0	-1.1	-1.2	130.2
*	-0.689	9.2	-0.0	-1.1	-0.4	130.4
*	-0.439	-51.7	-0.0	-1.9	-0.4	130.6
*	-0.189	-106.6	-0.0	-1.5	-0.1	130.5
*	0.061	-162.0	-0.0	-0.4	0.1	130.4
*	0.311	-217.4	-0.0	-1.9	0.6	130.7
*	0.561	-273.5	-0.0	-1.3	0.9	130.7
*	0.811	-327.0	-0.0	-1.1	1.8	130.8
*	1.061	-383.1	-0.0	-0.4	3.7	130.9
*	1.311	-437.5	-0.0	0.4	5.5	131.0
*	1.561	-493.1	-0.0	2.1	6.9	130.8
*	1.811	-548.0	-0.0	4.0	7.3	130.4
*	2.061	-603.0	-0.0	7.4	7.4	131.0
*	2.311	-658.3	-0.0	8.7	6.7	131.5
*	2.561	-712.7	-0.0	9.4	6.5	132.0
*	2.811	-770.0	-0.0	11.1	7.7	133.0
*	3.061	-826.1	-0.0	12.4	9.8	133.6
*	3.311	-881.8	-0.0	15.1	12.9	134.1
*	3.561	-939.8	-0.0	20.1	16.4	134.2
*	3.811	-993.3	-0.0	23.2	20.2	134.8
*	4.061	-1051.8	-0.0	28.9	23.6	135.1
*	4.311	-1109.3	-0.0	35.7	27.1	135.2
*	4.561	-1165.8	-0.0	42.9	30.9	135.3
*	4.811	-1222.3	-0.0	50.8	33.9	135.7
*	5.061	-1279.1	-0.0	60.1	36.0	135.7

-0.561

NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 966-APR-66 STA 82

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
5.311	-1334.9	-0.0	69.5	37.7	135.6
5.561	-1392.2	-0.0	79.7	38.7	135.6
5.811	-1448.5	-0.0	88.9	39.8	135.9
6.061	-1504.2	-0.0	98.8	40.7	136.7
6.311	-1560.6	-0.0	108.9	41.6	136.4
6.561	-1618.4	-0.0	120.5	42.3	136.5
6.811	-1676.6	-0.0	130.6	44.2	135.9
7.061	-1734.5	-0.0	141.9	45.4	135.4
7.311	-1794.9	-0.0	153.9	46.1	134.7
7.561	-1841.1	-0.0	164.7	46.5	134.6
7.811	-1897.8	-0.0	177.5	46.1	135.1
8.061	-1953.7	-0.0	189.0	45.0	134.8
8.311	-2009.6	-0.0	199.8	43.7	135.0
8.561	-2065.4	-0.0	210.8	42.1	134.7
8.811	-2120.4	-0.0	220.7	40.9	134.5
9.061	-2177.2	-0.0	230.7	39.9	134.2
9.311	-2233.2	-0.0	241.1	39.2	134.1
9.561	-2288.2	-0.0	250.4	38.8	134.3
9.811	-2343.8	-0.0	259.6	38.9	134.2
10.061	-2399.8	-0.0	269.6	39.4	134.4
10.311	-2456.1	-0.0	279.2	40.2	134.7
10.561	-2511.9	-0.0	289.7	41.0	135.1
10.811	-2568.0	-0.0	300.3	41.2	135.0
11.061	-2624.4	-0.0	310.5	41.3	135.2
11.311	-2680.9	-0.0	321.0	41.3	135.3
11.561	-2735.6	-0.0	330.9	40.9	135.1
11.811	-2793.1	-0.0	341.2	40.4	135.1
12.061	-2848.5	-0.0	352.0	39.6	134.8
12.311	-2904.1	-0.0	361.4	39.2	134.9
12.561	-2960.4	-0.0	370.8	38.3	134.8
12.811	-3016.8	-0.0	380.1	36.8	135.5
13.061	-3072.3	-0.0	390.2	36.2	135.5
13.311	-3127.4	-0.0	398.7	35.2	135.5
13.561	-3187.6	-0.0	406.6	34.1	135.3
13.811	-3242.1	-0.0	415.8	34.0	135.3
14.061	-3298.9	-0.0	423.7	34.1	134.7
14.311	-3355.1	-0.0	431.6	34.5	134.4
14.561	-3411.8	-0.0	441.9	33.6	135.2
14.811	-3466.9	-0.0	449.5	33.9	135.2

03-MAY-66

NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1038 FLT 37

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
-5.160	1233.7	-0.0	71.4	-4.5	129.0
-4.910	1179.7	-0.0	70.5	-7.2	129.1
-4.660	1124.7	-0.0	68.3	-10.2	129.2
-4.410	1069.9	-0.0	65.2	-12.7	129.7
-4.160	1015.4	-0.0	61.7	-15.5	130.1
-3.910	961.2	-0.0	56.9	-17.5	130.4
-3.660	903.7	-0.0	53.1	-18.9	130.5
-3.410	850.8	-0.0	47.1	-20.1	130.9
-3.169	795.5	-0.0	42.3	-20.8	131.2
-2.910	741.1	-0.0	37.3	-21.3	131.2
-2.660	685.3	-0.0	31.6	-21.1	131.5
-2.410	630.4	-0.0	26.0	-21.0	131.6
-2.160	575.0	-0.0	21.0	-19.8	131.9
-1.910	519.2	-0.0	16.0	-18.0	131.8
-1.660	464.1	-0.0	11.0	-15.9	132.1
-1.410	408.2	-0.0	3.0	-13.8	132.3
-1.160	353.0	-0.0	5.0	-11.4	132.3
-0.910	296.6	-0.0	2.3	-9.2	132.5
-0.660	240.5	-0.0	-0.1	-7.5	132.5
-0.410	185.0	-0.0	-1.3	-5.3	132.6
-0.160	129.2	-0.0	-2.5	-3.2	131.7
0.090	73.0	-0.0	-3.2	-1.6	130.5
0.340	17.2	-0.0	-2.9	-0.9	131.4
0.590	-35.7	-0.0	-2.7	-0.5	132.5
0.840	-88.8	-0.0	-2.9	-0.0	133.0
1.090	-150.7	-0.0	-3.3	-0.9	133.9
1.340	-208.0	-0.0	-3.6	-0.6	134.8
1.590	-262.4	-0.0	-2.7	-0.1	134.5
1.840	-319.3	-0.0	-4.5	1.3	132.8
2.090	-375.9	-0.0	-3.0	2.9	127.7
2.340	-431.4	-0.0	-2.9	4.2	129.3
2.590	-486.8	-0.0	-0.8	5.8	130.6
2.840	-525.9	-0.0	1.3	7.1	132.2
3.090	-598.3	-0.0	2.3	8.9	134.2
3.340	-651.1	-0.0	3.9	10.3	136.0
3.590	-710.6	-0.0	8.2	13.1	137.8
3.840	-767.0	-0.0	11.0	16.4	133.3
4.090	-822.3	-0.0	15.0	19.7	133.3
4.340	-878.8	-0.0	20.9	22.5	135.1
4.590	-934.7	-0.0	27.0	25.8	133.3
4.840	-990.0	-0.0	34.0	28.8	133.8
5.090	-1045.9	-0.0	41.2	31.0	133.8
5.340	-1102.4	-0.0	49.2	33.7	134.0
5.590	-1158.1	-0.0	58.5	36.5	134.2
5.840	-1214.2	-0.0	67.1	39.8	134.0
6.090	-1269.8	-0.0	77.1	42.6	133.3
6.340	-1325.2	-0.0	89.2	45.1	132.8
6.590	-1379.9	-0.0	100.7	47.9	132.6
6.840	-1433.6	-0.0	113.1	49.7	132.2
7.090	-1488.1	-0.0	125.5	51.2	131.6
7.340	-1542.6	-0.0	139.2	52.6	131.3
7.590	-1596.2	-0.0	152.5	54.0	131.4

NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1038-MAY-66 STA 82

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	7.840	-1648.9	-0.0	165.7	55.1	131.3
*	8.090	-1702.5	-0.0	179.3	56.4	131.3
*	8.340	-1757.3	-0.0	194.4	57.5	130.9
*	8.590	-1810.4	-0.0	208.2	57.8	130.4

04-MAY-66 NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1040 FLT 38

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-4.850	1674.6	-0.0	78.4	2.3	124.4
*	-4.600	1622.8	-0.0	78.3	1.9	123.3
*	-4.350	1569.6	-0.0	78.3	1.6	123.4
*	-4.100	1518.2	-0.0	79.3	1.6	123.7
*	-3.850	1466.7	-0.0	79.2	1.6	123.6
*	-3.600	1413.6	-0.0	79.9	1.2	123.4
*	-3.350	1361.4	-0.0	80.6	0.1	123.7
*	-3.100	1309.9	-0.0	80.1	-0.6	123.7
*	-2.850	1257.6	-0.0	80.0	-2.5	123.4
*	-2.600	1204.9	-0.0	78.9	-5.0	123.6
*	-2.350	1153.2	-0.0	78.8	-7.0	123.7
*	-2.100	1101.4	-0.0	75.6	-9.4	123.9
*	-1.850	1048.5	-0.0	72.4	-11.4	124.4
*	-1.600	996.9	-0.0	70.0	-13.3	124.9
*	-1.350	943.6	-0.0	66.1	-14.6	125.3
*	-1.100	890.5	-0.0	62.6	-16.0	125.6
*	-0.850	837.7	-0.0	58.5	-17.4	126.2
*	-0.600	785.2	-0.0	53.4	-18.3	126.6
*	-0.350	731.5	-0.0	48.6	-18.5	127.1
*	-0.100	678.0	-0.0	44.1	-17.7	127.6
*	-0.150	623.8	-0.0	39.0	-16.7	128.0
*	0.400 .4CO	570.0	-0.0	35.5	-15.7	128.1
*	0.650	516.4	-0.0	32.2	-14.6	128.4
*	0.900	462.0	-0.0	28.1	-13.4	128.3
*	1.150	408.0	-0.0	24.9	-12.5	126.5
*	1.400	353.5	-0.0	22.0	-11.7	127.4
*	1.650	299.8	-0.0	19.2	-10.8	128.3
*	1.900	253.4	-0.0	17.1	-11.1	129.4
*	2.150	190.5	-0.0	14.2	-12.5	130.6
*	2.400	135.8	-0.0	11.6	-12.9	131.9
*	2.650	80.6	-0.0	7.6	-12.2	132.7
*	2.900	25.5	-0.0	2.3	-10.2	130.9
*	3.150	-30.1	-0.0	1.2	-7.4	131.1
*	3.400	-84.5	-0.0	0.4	-3.6	131.1
*	3.650	-140.8	-0.0	0.0	-0.2	130.9
*	3.900	-195.9	-0.0	-0.1	1.4	130.6
*	4.150	-251.2	-0.0	1.2	2.7	130.5
*	4.400	-305.6	-0.0	2.1	4.3	129.9
*	4.650	-360.3	-0.0	2.9	4.9	130.0
*	4.900	-415.3	-0.0	4.1	5.0	130.0
*	5.150	-469.6	-0.0	6.6	4.7	130.2
*	5.400	-525.5	-0.0	6.9	3.8	130.5

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1040 04-MAY-66 STA

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	5.650	-580.1	-0.0	8.4	3.6	130.5
*	5.900	-633.2	-0.0	8.4	3.7	131.6
*	6.150	-699.9	-0.0	8.3	4.4	131.8
*	6.400	-745.0	-0.0	11.0	4.9	132.4
*	6.650	-804.6	-0.0	12.7	5.7	132.8
*	6.900	-858.1	-0.0	13.5	5.9	133.1
*	7.150	-914.8	-0.0	14.9	6.2	133.5
*	7.400	-971.2	-0.0	16.4	7.5	133.6
*	7.650	-1027.6	-0.0	17.8	9.7	135.0
*	7.900	-1084.3	-0.0	21.1	12.3	136.3
*	8.150	-1142.1	-0.0	24.0	15.7	135.8
*	8.400	-1200.0	-0.0	28.4	19.3	136.3
*	8.650	-1256.3	-0.0	33.4	23.1	136.2
*	8.900	-1313.9	-0.0	40.2	27.1	136.2
*	9.150	-1371.2	-0.0	47.0	31.0	136.1
*	9.400	-1427.4	-0.0	55.7	34.4	136.6
*	9.650	-1484.7	-0.0	64.4	37.6	136.8
*	9.900	-1541.0	-0.0	74.7	41.0	136.8
*	10.150	-1599.0	-0.0	84.7	43.5	136.2
*	10.400	-1655.8	-0.0	96.3	46.6	136.0
*	10.650	-1710.9	-0.0	108.9	48.3	135.4
*	10.900	-1765.2	-0.0	120.3	50.4	135.3
*	11.150	-1822.3	-0.0	134.6	52.3	135.2
*	11.400	-1877.1	-0.0	146.2	52.9	135.1
*	11.650	-1934.1	-0.0	160.5	54.3	134.7
*	11.900	-1987.8	-0.0	175.3	54.7	133.6
*	12.150	-2042.9	-0.0	187.1	56.1	133.2
*	12.400	-2095.5	-0.0	202.4	57.7	132.5
*	12.650	-2150.3	-0.0	215.9	60.0	132.4
*	12.900	-2204.7	-0.0	231.2	61.5	132.0
*	13.150	-2258.0	-0.0	248.4	60.2	131.1
*	13.400	-2310.6	-0.0	264.8	60.4	130.3
*	13.650	-2364.1	-0.0	278.1	59.2	129.3
*	13.900	-2415.3	-0.0	290.2	57.7	128.9
*	14.150	-2468.0	-0.0	307.7	56.9	128.9
*	14.400	-2520.0	-0.0	321.4	57.1	128.4
*	14.650	-2573.3	-0.0	335.5	56.5	128.4
*	14.900	-2620.0	-0.0	349.0	54.2	127.8
*	15.150	-2676.3	-0.0	363.0	53.5	127.0
*	15.400	-2729.3	-0.0	375.9	53.3	125.5
*	15.650	-2781.0	-0.0	388.6	53.0	124.8
*	15.900	-2831.5	-0.0	401.8	52.2	124.3
*	16.150	-2879.5	-0.0	416.0	51.1	123.5
*	16.400	-2932.0	-0.0	428.6	51.1	122.9
*	16.650	-2982.6	-0.0	440.4	50.1	122.6
*	16.900	-3033.2	-0.0	451.7	49.3	121.3
*	17.150	-3081.3	-0.0	466.4	49.7	119.9
*	17.400	-3131.6	-0.0	477.3	49.6	119.3
*	17.650	-3177.3	-0.0	489.9	49.6	119.2
*	17.900	-3227.3	-0.0	502.9	48.6	119.2
*	18.150	-3276.5	-0.0	514.7	47.5	118.9
*	18.400	-3326.1	-0.0	526.7	46.1	118.6

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1040 04-MAY-66 STA

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	18.650	-3374.1	-0.0	538.6	44.1	116.5
*	18.900	-3422.4	-0.0	547.8	43.3	115.7
*	19.150	-3469.1	-0.0	559.4	42.0	114.7
*	19.400	-3513.8	-0.0	569.0	40.8	113.8
*	19.650	-3564.0	-0.0	580.5	40.3	112.9
*	19.900	-3610.0	-0.0	589.7	39.3	113.6
*	20.150	-3655.3	-0.0	598.8	38.5	112.8
*	20.400	-3700.8	-0.0	608.8	37.1	112.1
*	20.650	-3751.2	-0.0	618.6	36.7	111.7
*	20.900	-3793.7	-0.0	627.1	36.3	111.8
*	21.150	-3842.7	-0.0	635.6	35.2	110.8
*	21.400	-3885.7	-0.0	644.8	31.9	109.8
*	21.650	-3933.5	-0.0	652.7	31.5	109.6
*	21.900	-3977.8	-0.0	657.0	31.7	108.7
*	22.150	-4024.1	-0.0	667.1	32.3	109.4
*	22.400	-4067.4	-0.0	675.6	33.1	108.5
*	22.650	-4113.1	-0.0	684.6	34.3	108.1
*	22.900	-4160.5	-0.0	693.4	31.8	106.2
*	23.150	-4202.3	-0.0	700.7	31.8	106.6
*	23.400	-4246.2	-0.0	708.6	31.6	106.4
*	23.650	-4286.9	-0.0	714.0	30.6	106.1
*	23.900	-4336.0	-0.0	725.2	30.7	107.0
*	24.150	-4380.6	-0.0	732.7	29.6	106.6
*	24.400	-4423.4	-0.0	737.9	29.2	105.7

06-MAY-66 NORTH 40 SPACE POSITIONING PROGRAM PASS 1
LIC 5055 DROP NUMBER 1042 FLT 41

*	TIME	X	Y	ALT	R/C	TOTAL VELOCITY
*	SECONDS	FEET	FEET	FEET	FT/SEC	KNOTS
*	-7.318	1602.9	-0.0	75.6	1.3	126.1
*	-7.068	1549.6	-0.0	75.5	1.8	126.3
*	-6.818	1495.9	-0.0	76.4	2.1	126.7
*	-6.568	1442.8	-0.0	76.6	2.0	126.7
*	-6.318	1389.0	-0.0	77.5	1.4	126.7
*	-6.068	1335.5	-0.0	78.4	-0.1	126.8
*	-5.818	1282.2	-0.0	78.1	-1.7	127.2
*	-5.568	1228.9	-0.0	77.0	-4.3	127.2
*	-5.318	1174.6	-0.0	75.7	-7.3	127.5
*	-5.068	1120.4	-0.0	74.2	-9.3	128.0
*	-4.818	1067.4	-0.0	71.1	-11.6	128.2
*	-4.568	1013.5	-0.0	66.8	-13.7	128.4
*	-4.318	958.8	-0.0	64.7	-15.6	128.9
*	-4.068	904.5	-0.0	59.8	-16.4	129.4
*	-3.818	850.1	-0.0	55.4	-17.3	129.5
*	-3.568	794.9	-0.0	50.6	-17.9	129.9
*	-3.318	740.5	-0.0	46.7	-17.5	130.2
*	-3.068	686.2	-0.0	41.7	-18.2	130.4
*	-2.818	631.1	-0.0	37.9	-18.3	130.6
*	-2.568	575.7	-0.0	33.6	-17.9	131.2
*	-2.318	520.8	-0.0	27.3	-17.3	131.8
*	-2.068	465.8	-0.0	23.6	-16.8	132.0
*	-1.818	409.4	-0.0	20.4	-15.9	132.3
*	-1.568	353.2	-0.0	16.2	-14.4	132.6
*	-1.318	297.3	-0.0	12.5	-13.8	132.7
*	-1.068	241.7	-0.0	8.6	-12.2	132.7
*	-0.818	186.1	-0.0	6.3	-11.0	133.0
*	-0.568	130.2	-0.0	3.3	-9.8	133.2
*	-0.318	73.8	-0.0	2.8	-7.6	133.2
*	-0.068	17.1	-0.0	-1.0	-5.6	133.4
*	0.182	-38.5	-0.0	-2.6	-3.0	133.7
*	0.432	-94.9	-0.0	-1.7	2.6	133.4
*	0.682	-151.7	-0.0	-1.7	3.4	133.6
*	0.932	-207.4	-0.0	-0.7	2.7	134.1
*	1.182	-264.4	-0.0	-0.6	1.0	134.4
*	1.432	-321.2	-0.0	-0.5	-0.6	134.7
*	1.682	-373.5	-0.0	-0.3	-2.1	135.2
*	1.932	-435.6	-0.0	-0.4	-3.4	135.3
*	2.182	-492.4	-0.0	-0.3	0.2	134.7
*	2.432	-550.0	-0.0	0.1	0.7	134.8
*	2.682	-605.7	-0.0	-0.2	1.2	135.1
*	2.932	-661.9	-0.0	-0.2	1.6	135.6
*	3.182	-720.8	-0.0	1.1	1.7	136.3
*	3.432	-778.0	-0.0	1.5	2.0	136.8
*	3.682	-834.1	-0.0	1.8	1.9	137.7
*	3.932	-894.4	-0.0	2.3	1.7	136.9
*	4.182	-950.9	-0.0	2.5	2.0	136.9
*	4.432	-1011.1	-0.0	3.0	2.1	136.6
*	4.682	-1065.6	-0.0	3.8	2.1	136.8
*	4.932	-1124.9	-0.0	4.5	2.7	137.0
*	5.182	-1183.0	-0.0	4.9	3.1	137.3
*	5.432	-1241.4	-0.0	5.0	3.1	137.4

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1042 06-MAY-66 STA 82

TIME	X	Y	ALT	R/C	TOTAL VELOCITY
SECONDS	FEET	FEET	FEET	FT/SEC	KNOTS
5.682	-1298.8	-0.0	7.1	3.6	137.2
5.932	-1353.7	-0.0	7.7	3.8	137.4
6.182	-1412.0	-0.0	8.0	3.6	137.6
6.432	-1472.5	-0.0	9.8	3.5	138.1
6.682	-1531.3	-0.0	10.4	3.2	138.6
6.932	-1590.1	-0.0	10.5	3.7	139.2
7.182	-1641.4	-0.0	12.7	4.6	138.2
7.432	-1707.8	-0.0	11.8	5.6	138.0
7.682	-1764.1	-0.0	14.6	6.3	138.1
7.932	-1823.4	-0.0	17.1	6.2	137.7
8.182	-1880.7	-0.0	18.3	6.3	137.5
8.432	-1940.4	-0.0	19.6	6.7	137.8
8.682	-1996.7	-0.0	20.7	6.0	138.0
8.932	-2055.0	-0.0	21.4	6.8	137.8
9.182	-2113.6	-0.0	24.3	7.5	137.3
9.432	-2173.4	-0.0	26.5	7.6	137.4
9.682	-2228.9	-0.0	28.4	7.4	136.9
9.932	-2283.4	-0.0	30.4	7.4	136.1
10.182	-2344.6	-0.0	31.1	7.7	135.7
10.432	-2402.0	-0.0	32.9	8.1	135.3
10.682	-2456.3	-0.0	36.3	9.5	135.8
10.932	-2515.8	-0.0	38.5	10.9	135.4
11.182	-2570.6	-0.0	40.2	11.5	135.8
11.432	-2633.2	-0.0	44.6	11.5	136.5
11.682	-2686.6	-0.0	47.4	11.6	136.0
11.932	-2745.0	-0.0	50.3	10.4	135.8
12.182	-2803.7	-0.0	52.8	3.1	135.0
12.432	-2858.0	-0.0	55.3	3.8	135.5
12.682	-2915.3	-0.0	55.5	4.5	135.1
12.932	-2973.9	-0.0	44.7	6.0	135.0
13.182	-3030.5	-0.0	59.0	8.1	135.6
13.432	-3087.1	-0.0	60.1	10.2	134.7
13.682	-3144.0	-0.0	62.4	11.5	134.3
13.932	-3201.6	-0.0	64.5	5.9	134.2
14.182	-3255.5	-0.0	65.1	5.9	132.1

06-MAY-66 NORTH 40 SPACE POSITIONING PROGRAM PASS 2
LIC 5055 DROP NUMBER 1042 FLT 41

*	TIME	X	Y	ALT	R/C	TOTAL VELOCITY
*	SECONDS	FEET	FEET	FEET	FT/SEC	KNOTS
*	-7.543	1717.9	-0.0	80.4	0.8	129.7
*	-7.293	1665.2	-0.0	81.9	1.0	130.2
*	-7.043	1610.0	-0.0	82.2	0.4	130.3
*	-6.793	1555.3	-0.0	81.3	0.2	130.2
*	-6.543	1500.0	-0.0	81.9	-0.6	130.0
*	-6.293	1445.3	-0.0	80.8	-1.4	129.7
*	-6.043	1390.5	-0.0	81.6	-1.8	129.4
*	-5.793	1336.3	-0.0	80.9	-3.8	129.2
*	-5.543	1281.6	-0.0	79.1	-5.0	129.1
*	-5.293	1227.0	-0.0	78.8	-6.9	129.5
*	-5.043	1172.8	-0.0	75.2	-8.7	130.0
*	-4.793	1118.4	-0.0	74.1	-10.4	130.2
*	-4.543	1062.1	-0.0	71.4	-12.4	130.7
*	-4.293	1007.6	-0.0	67.3	-13.7	130.9
*	-4.043	952.8	-0.0	63.8	-16.1	131.3
*	-3.793	897.3	-0.0	59.9	-17.1	131.5
*	-3.543	842.1	-0.0	55.2	-17.7	132.2
*	-3.293	786.0	-0.0	49.9	-18.4	132.7
*	-3.043	730.5	-0.0	46.0	-19.0	133.0
*	-2.793	673.8	-0.0	41.2	-19.4	133.4
*	-2.543	618.1	-0.0	36.2	-19.7	133.8
*	-2.293	561.9	-0.0	31.0	-19.8	134.3
*	-2.043	505.5	-0.0	25.7	-19.5	134.7
*	-1.793	448.5	-0.0	20.9	-18.7	135.0
*	-1.543	391.3	-0.0	16.8	-17.0	135.4
*	-1.293	334.5	-0.0	12.1	-14.8	136.0
*	-1.043	278.0	-0.0	8.2	-12.3	136.2
*	-0.793	219.7	-0.0	6.0	-9.8	136.1
*	-0.543	161.3	-0.0	4.0	-7.4	136.2
*	-0.293	104.3	-0.0	2.7	-5.1	135.9
*	-0.043	48.1	-0.0	1.4	-3.3	135.4
*	0.207	-10.1	-0.0	0.5	-1.7	135.2
*	0.457	-66.2	-0.0	0.8	0.1	135.3
*	0.707	-123.8	-0.0	1.2	1.8	135.7
*	0.957	-180.8	-0.0	1.3	2.8	135.6
*	1.207	-238.1	-0.0	2.7	3.6	135.7
*	1.457 0.539	-291.1	-0.0	4.1	5.3	135.7
*	1.707	-352.7	-0.0	4.4	7.0	135.9
*	1.957	-409.6	-0.0	6.1	8.0	135.9
*	2.207	-467.3	-0.0	9.9	8.6	136.0
*	2.457	-525.3	-0.0	12.1	8.6	136.5
*	2.707	-582.0	-0.0	14.2	7.2	136.7
*	2.957	-640.0	-0.0	15.7	5.6	136.6
*	3.207	-697.8	-0.0	16.6	4.7	137.3
*	3.457	-755.6	-0.0	17.3	4.2	138.3
*	3.707	-813.1	-0.0	18.7	4.7	139.1
*	3.957	-873.3	-0.0	19.5	6.4	139.7
*	4.207	-931.7	-0.0	20.8	8.9	140.4
*	4.457	-992.8	-0.0	23.2	12.1	140.9
*	4.707	-1050.4	-0.0	27.0	16.9	140.7
*	4.957	-1115.3	-0.0	31.2	21.7	140.8
*	5.207	-1170.0	-0.0	37.2	26.5	141.1

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1042-MAY-66 STA 82

*	TIME	X	Y	ALT	R/C	TOTAL VELOCITY
*	SECONDS	FEET	FEET	FEET	FT/SEC	KNOTS
*	5.457	-1221.3	-0.0	45.3	30.1	141.0
*	5.707	-1287.4	-0.0	53.2	33.9	140.9
*	5.957	-1346.7	-0.0	62.8	37.0	141.1
*	6.207	-1404.3	-0.0	70.8	40.6	140.9
*	6.457	-1462.7	-0.0	82.0	45.2	140.6
*	6.707	-1523.0	-0.0	93.1	49.3	141.4
*	6.957	-1579.1	-0.0	107.1	53.5	140.7
*	7.207	-1636.5	-0.0	121.7	56.8	139.8
*	7.457	-1698.3	-0.0	135.6	60.6	139.0
*	7.707	-1741.9	-0.0	150.5	64.2	137.9
*	7.957	-1807.3	-0.0	166.9	67.3	137.0
*	8.207	-1862.0	-0.0	185.0	70.3	136.8
*	8.457	-1914.4	-0.0	204.3	72.4	137.1
*	8.707	-1971.2	-0.0	221.4	73.7	135.7
*	8.957	-2028.0	-0.0	239.9	74.4	135.1
*	9.207	-2079.1	-0.0	258.5	75.4	134.4
*	9.457	-2130.8	-0.0	278.0	76.6	133.1
*	9.707	-2184.9	-0.0	297.0	77.4	132.1
*	9.957	-2237.0	-0.0	317.1	77.6	132.1
*	10.207	-2289.2	-0.0	336.0	76.6	130.8
*	10.457	-2341.3	-0.0	355.9	75.8	129.7
*	10.707	-2392.5	-0.0	374.6	74.3	128.9
*	10.957	-2441.2	-0.0	392.0	74.2	128.0
*	11.207	-2493.5	-0.0	411.1	73.2	127.0
*	11.457	-2544.3	-0.0	428.5	72.6	126.7
*	11.707	-2593.0	-0.0	446.5	71.6	126.2
*	11.957	-2642.1	-0.0	465.4	70.6	124.7
*	12.207	-2694.7	-0.0	482.6	69.3	123.2
*	12.457	-2742.6	-0.0	499.2	67.6	122.6
*	12.707	-2790.0	-0.0	517.3	67.3	122.0
*	12.957	-2837.0	-0.0	533.1	66.2	121.3
*	13.207	-2887.8	-0.0	549.5	65.3	121.3
*	13.457	-2933.8	-0.0	566.4	63.5	120.0
*	13.707	-2985.4	-0.0	581.6	62.9	119.1
*	13.957	-3032.0	-0.0	597.5	61.9	117.9
*	14.207	-3076.1	-0.0	611.8	60.6	117.6
*	14.457	-3124.8	-0.0	628.1	59.7	117.3
*	14.707	-3173.0	-0.0	642.8	58.7	117.3
*	14.957	-3221.1	-0.0	656.7	58.0	117.9
*	15.207	-3267.4	-0.0	671.1	56.4	116.5
*	15.457	-3313.5	-0.0	685.4	55.9	115.4
*	15.707	-3362.6	-0.0	699.6	54.7	115.1
*	15.957	-3406.8	-0.0	712.4	52.9	114.9
*	16.207	-3452.9	-0.0	726.6	51.8	116.1
*	16.457	-3501.4	-0.0	738.3	51.1	113.3
*	16.707	-3547.3	-0.0	750.2	50.1	113.8

10-MAY-66 NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1072 **FLT 43**

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-4.629	919.1	-0.0	41.5	-14.4	102.2
*	-4.379	875.2	-0.0	39.1	-14.4	103.5
*	-4.129	832.5	-0.0	31.0	-14.2	103.7
*	-3.879	788.4	-0.0	31.2	-13.2	103.8
*	-3.629	744.2	-0.0	27.7	-12.6	104.1
*	-3.379	700.0	-0.0	23.8	-11.6	104.4
*	-3.129	657.2	-0.0	22.0	-12.2	104.0
*	-2.879	612.2	-0.0	18.2	-11.4	104.0
*	-2.629	568.3	-0.0	15.7	-11.2	104.0
*	-2.379	524.3	-0.0	12.5	-11.0	104.2
*	-2.129	480.3	-0.0	10.8	-10.2	104.6
*	-1.879	437.0	-0.0	7.0	-9.9	105.1
*	-1.629	392.7	-0.0	5.5	-8.8	105.2
*	-1.379	347.0	-0.0	2.4	-7.7	105.6
*	-1.129	302.7	-0.0	1.2	-5.5	106.0
*	-0.879	258.0	-0.0	-0.1	-6.1	105.6
*	-0.629	213.6	-0.0	-1.6	-5.1	105.6
*	-0.379	168.8	-0.0	-2.7	-3.9	106.1
*	-0.129	124.7	-0.0	-4.4	-2.7	106.4
*	0.121	79.0	-0.0	-5.6	-1.5	106.9
*	0.371	33.8	-0.0	-5.8	-0.5	107.0
*	0.621	-11.4	-0.0	-4.1	-0.2	107.2
*	0.871	-56.9	-0.0	-4.4	-0.3	107.3
*	1.121	-101.6	-0.0	-4.2	-0.6	107.2
*	1.371	-146.6	-0.0	-5.1	-0.6	107.7
*	1.621	-193.0	-0.0	-4.9	-0.3	108.1
*	1.871	-236.3	-0.0	-4.9	-0.1	108.2
*	2.121	-284.2	-0.0	-5.0	1.9	108.2
*	2.371	-330.3	-0.0	-4.6	2.7	108.4
*	2.621	-376.1	-0.0	-4.8	3.7	108.0
*	2.871	-420.6	-0.0	-0.8	3.5	108.2
*	3.121	-467.6	-0.0	-1.3	3.3	108.2
*	3.371	-513.6	-0.0	0.1	1.7	108.0
*	3.621	-558.8	-0.0	-0.2	-0.9	108.9
*	3.871	-604.7	-0.0	-0.3	-2.2	108.7
*	4.121	-650.6	-0.0	-1.6	-3.4	109.3
*	4.371	-697.1	-0.0	-2.6	-3.1	110.0
*	4.621	-742.0	-0.0	-4.1	-2.2	110.6
*	4.871	-790.5	-0.0	-4.6	-0.6	111.3
*	5.121	-837.4	-0.0	-3.8	1.8	111.8
*	5.371	-885.1	-0.0	-3.2	4.3	112.6
*	5.621	-931.8	-0.0	-2.7	7.1	112.7
*	5.871	-979.7	-0.0	0.2	9.0	113.0
*	6.121	-1026.2	-0.0	2.4	13.4	113.2
*	6.371	-1075.3	-0.0	6.6	17.3	114.2
*	6.621	-1123.0	-0.0	10.0	21.3	114.6
*	6.871	-1172.0	-0.0	17.0	25.3	115.4
*	7.121	-1221.0	-0.0	23.7	29.2	116.2
*	7.371	-1267.9	-0.0	32.2	33.4	116.3
*	7.621	-1317.3	-0.0	40.2	37.0	116.0
*	7.871	-1366.1	-0.0	50.1	40.1	116.3
*	8.121	-1413.3	-0.0	61.3	44.3	116.9

NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1072-MAY-66 STA 62

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
8.371	-1462.0	-0.0	72.4	47.0	110.0
8.621	-1509.6	-0.0	84.9	48.9	110.4
8.871	-1556.6	-0.0	98.3	51.8	110.5
9.121	-1605.2	-0.0	111.2	54.6	110.0
9.371	-1650.6	-0.0	122.3	56.6	115.8
9.621	-1698.3	-0.0	140.2	58.7	115.3
9.871	-1745.7	-0.0	154.9	61.2	114.8
10.121	-1790.3	-0.0	170.0	62.6	114.3
10.371	-1835.1	-0.0	185.1	62.8	113.1
10.621	-1880.4	-0.0	202.1	64.4	112.4
10.871	-1924.4	-0.0	217.1	66.1	111.7
11.121	-1968.4	-0.0	234.6	67.1	110.9
11.371	-2011.5	-0.0	251.5	67.6	109.9
11.621	-2055.3	-0.0	269.2	68.6	109.4
11.871	-2097.1	-0.0	285.5	68.9	108.5
12.121	-2139.4	-0.0	302.7	69.4	107.6
12.371	-2181.8	-0.0	320.4	69.4	106.9
12.621	-2222.7	-0.0	338.2	69.3	105.8
12.871	-2263.4	-0.0	355.9	69.1	104.9
13.121	-2305.1	-0.0	372.5	67.8	103.5
13.371	-2343.6	-0.0	388.9	66.7	102.5
13.621	-2384.4	-0.0	406.7	66.4	101.7
13.871	-2422.8	-0.0	421.8	66.3	101.1
14.121	-2462.6	-0.0	436.3	65.1	100.8
14.371	-2501.1	-0.0	455.9	64.0	99.9
14.621	-2540.9	-0.0	472.1	63.7	99.7
14.871	-2579.8	-0.0	485.8	63.3	98.9
15.121	-2617.6	-0.0	502.2	63.5	98.6
15.371	-2656.8	-0.0	518.0	63.7	98.3
15.621	-2693.5	-0.0	534.6	63.8	98.1
15.871	-2732.8	-0.0	551.5	63.2	98.1
16.121	-2771.0	-0.0	566.1	62.8	97.3
16.371	-2808.7	-0.0	580.9	61.9	97.0
16.621	-2847.5	-0.0	597.3	61.8	96.3
16.871	-2883.2	-0.0	612.9	62.2	96.2
17.121	-2921.5	-0.0	627.7	60.4	95.7
17.371	-2958.4	-0.0	643.8	57.7	95.2
17.621	-2996.6	-0.0	659.2	54.7	94.5
17.871	-3033.6	-0.0	670.3	52.3	94.0
18.121	-3072.0	-0.0	683.2	50.7	94.1
18.371	-3107.2	-0.0	694.7	50.4	94.1

11-MAY-66 NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1073 FLT 44

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-5.053	1183.8	-0.0	60.9	-8.3	121.0
*	-4.803	1132.1	-0.0	78.4	-10.6	121.0
*	-4.553	1082.9	-0.0	75.1	-12.9	122.0
*	-4.303	1031.2	-0.0	71.4	-14.9	103.5
*	-4.053	980.1	-0.0	68.1	-16.6	109.9
*	-3.803	925.9	-0.0	63.1	-18.2	116.4
*	-3.553	949.8	-0.0	58.6	-19.8	123.0
*	-3.303	825.1	-0.0	53.4	-21.3	129.6
*	-3.053	773.1	-0.0	47.7	-22.1	136.2
*	-2.803	720.7	-0.0	42.0	-22.8	143.7
*	-2.553	667.9	-0.0	36.2	-22.5	126.0
*	-2.303	614.7	-0.0	30.3	-21.4	126.5
*	-2.053	561.5	-0.0	24.6	-20.0	126.7
*	-1.803	508.0	-0.0	20.3	-18.6	127.1
*	-1.553	454.6	-0.0	16.2	-16.4	127.1
*	-1.303	401.5	-0.0	11.8	-13.9	127.4
*	-1.053	347.0	-0.0	8.0	-11.4	127.6
*	-0.803	294.0	-0.0	6.0	-9.1	127.5
*	-0.553	239.4	-0.0	4.3	-6.2	127.4
*	-0.303	185.6	-0.0	3.6	-3.7	127.4
*	-0.053	132.9	-0.0	1.7	-2.4	150.1
*	0.197	78.8	-0.0	2.3	-2.9	142.9
*	0.447	24.2	-0.0	2.6	-2.3	135.6
*	0.697	-118.0	-0.0	1.9	-2.4	129.6
*	0.947	-84.6	-0.0	-1.6	-2.9	122.3
*	1.197 (0.993)	-141.6	-0.0	0.5	-3.[illegible]	115.0
*	1.447	-194.2	-0.0	-1.2	-2.5	107.9
*	1.697	-249.3	-0.0	-1.6	-0.7	130.2
*	1.947	-304.7	-0.0	-3.2	0.2	130.2
*	2.197	-360.3	-0.0	-2.2	2.6	130.8
*	2.447	-414.8	-0.0	-0.7	4.1	130.8
*	2.697	-470.[illegible]	-0.0	0.8	4.5	130.7
*	2.947	-525.2	-0.0	2.5	4.1	130.7
*	3.197	-580.6	-0.0	3.2	3.8	130.9
*	3.447	-635.8	-0.0	3.3	3.0	130.9
*	3.697	-690.[illegible]	-0.0	4.0	2.7	131.0
*	3.947	-746.1	-0.0	5.7	2.6	131.0
*	4.197	-801.6	-0.0	5.4	3.3	131.1
*	4.447	-856.9	-0.0	6.6	4.2	131.6
*	4.697	-912.1	-0.0	6.6	5.5	131.8
*	4.947	-967.9	-0.0	8.9	8.6	132.0
*	5.197	-1024.5	-0.0	11.2	11.5	132.6
*	5.447	-1079.6	-0.0	13.9	15.2	133.1
*	5.697	-1135.[illegible]	-0.0	19.0	18.6	133.5
*	5.947	-1192.2	-0.0	23.6	22.9	134.0
*	6.197	-1248.6	-0.0	29.6	27.1	134.6
*	6.447	-1304.9	-0.0	36.8	32.3	134.7
*	6.697	-1361.5	-0.0	46.0	37.9	135.3
*	6.947	-1417.6	-0.0	54.8	42.9	135.4
*	7.197	-1472.6	-0.0	68.1	47.3	135.4
*	7.447	-1530.7	-0.0	80.3	51.0	135.1
*	7.697	-1585.0	-0.0	93.2	54.6	134.7

NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1073-MAY-66 STA 82

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	7.947	-1640.0	-0.0	107.2	56.7	134.5
*	8.197	-1694.2	-0.0	121.6	60.0	133.8
*	8.447	-1748.2	-0.0	137.6	62.3	133.9
*	8.697	-1804.1	-0.0	152.8	64.0	133.5
*	8.947	-1859.5	-0.0	170.4	65.7	133.0
*	9.197	-1910.7	-0.0	186.1	66.9	132.5
*	9.447	-1963.6	-0.0	202.6	68.7	132.0
*	9.697	-2016.0	-0.0	220.5	69.2	131.7
*	9.947	-2069.1	-0.0	237.8	70.4	131.1
*	10.197	-2121.7	-0.0	256.7	71.3	130.9
*	10.447	-2173.4	-0.0	273.0	71.9	130.4
*	10.697	-2225.2	-0.0	291.5	73.1	129.5
*	10.947	-2277.2	-0.0	309.9	74.3	129.1
*	11.197	-2328.1	-0.0	328.8	75.5	128.7
*	11.447	-2377.7	-0.0	348.0	75.9	127.8
*	11.697	-2429.3	-0.0	367.7	75.7	126.8
*	11.947	-2479.1	-0.0	385.7	75.2	126.2
*	12.197	-2527.9	-0.0	404.9	74.6	125.[illegible]
*	12.447	-2577.5	-0.0	423.1	74.2	124.0
*	12.697	-2627.0	-0.0	441.7	74.5	123.6
*	12.947	-2674.3	-0.0	460.2	73.8	122.7
*	13.197	-2722.7	-0.0	478.8	73.0	122.0
*	13.447	-2771.6	-0.0	497.9	71.3	120.5
*	13.697	-2818.0	-0.0	514.8	70.0	119.8
*	13.947	-2867.2	-0.0	532.0	68.6	118.8
*	14.197	-2911.2	-0.0	548.4	67.3	118.2
*	14.447	-2959.3	-0.0	565.9	67.1	118.2
*	14.697	-3006.4	-0.0	582.3	66.8	117.5
*	14.947	-3053.6	-0.0	598.7	66.2	117.0
*	15.197	-3100.6	-0.0	615.6	65.9	116.5
*	15.447	-3145.3	-0.0	632.1	65.3	116.0
*	15.697	-3189.7	-0.0	647.7	64.5	115.1
	15.947	-3238.7	-0.0	664.9	63.6	114.7
*	16.197	-3284.1	-0.0	679.8	63.6	114.7
*	16.447	-3327.8	-0.0	695.4	63.2	114.1
*	16.697	-3373.9	-0.0	711.1	61.9	112.8
*	16.947	-3419.3	-0.0	728.1	61.1	112.4
*	17.197	-3463.9	-0.0	742.5	59.2	112.0
*	17.447	-3508.5	-0.0	756.6	57.2	110.9
*	17.697	-3552.8	-0.0	771.1	55.8	110.4
*	17.947	-3597.7	-0.0	784.2	54.8	109.8
*	18.197	-3641.0	-0.0	797.7	53.5	109.0
*	18.447	-3684.2	-0.0	812.4	51.6	108.0
*	18.697	-3728.9	-0.0	824.4	50.2	106.4
*	18.947	-3772.4	-0.0	836.4	48.6	106.1
*	19.197	-3815.2	-0.0	847.8	46.0	104.7
*	19.447	-3855.3	-0.0	859.8	44.5	104.1
*	19.697	-3901.7	-0.0	871.8	43.2	103.6

13-MAY-66 NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1075 FLT 46

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-5.042	1234.5	-0.0	88.5	-8.5	129.6
*	-4.792	1183.8	-0.0	85.6	-10.8	129.7
*	-4.542	1129.0	-0.0	83.3	-13.1	130.0
*	-4.292	1078.6	-0.0	79.5	-15.2	130.8
*	-4.042	1020.0	-0.0	74.8	-16.8	131.4
*	-3.792	963.7	-0.0	70.7	-18.4	132.5
*	-3.542	907.6	-0.0	65.7	-19.2	133.3
*	-3.292	851.8	-0.0	61.1	-19.8	134.1
*	-3.042	794.2	-0.0	55.7	-20.5	134.2
*	-2.792	738.3	-0.0	50.6	-20.9	134.6
*	-2.542	682.0	-0.0	45.4	-21.0	135.0
*	-2.292	625.5	-0.0	39.8	-20.9	135.1
*	-2.042	568.2	-0.0	34.4	-20.3	135.6
*	-1.792	510.9	-0.0	29.9	-19.4	135.9
*	-1.542	454.0	-0.0	24.5	-18.2	136.1
*	-1.292	396.6	-0.0	20.5	-16.7	136.2
*	-1.042	339.6	-0.0	16.2	-15.2	136.3
*	-0.792	281.8	-0.0	12.7	-13.2	136.7
*	-0.542	224.3	-0.0	9.6	-11.3	137.0
*	-0.292	166.6	-0.0	6.9	-9.2	137.2
*	-0.042	108.2	-0.0	4.9	-6.7	137.5
*	0.208	50.6	-0.0	3.7	-4.0	137.9
*	0.458	-7.5	-0.0	2.4	-1.5	138.1
*	0.708	-66.3	-0.0	2.8	0.6	138.2
*	0.958	-124.9	-0.0	3.8	2.5	138.6
*	1.208	-183.0	-0.0	4.5	4.3	138.6
*	1.458	-241.3	-0.0	5.3	5.6	138.6
*	1.708	-300.4	-0.0	7.1	7.4	138.6
*	1.958	-359.4	-0.0	9.0	9.5	138.8
*	2.208	-417.1	-0.0	11.6	11.0	138.9
*	2.458	-475.4	-0.0	15.1	11.9	138.7
*	2.708	-534.1	-0.0	18.6	11.7	139.0
*	2.958	-592.8	-0.0	21.3	10.1	139.0
*	3.208	-650.6	-0.0	24.4	8.1	139.4
*	3.458	-710.4	-0.0	25.7	6.5	139.7
*	3.708	-768.6	-0.0	26.3	5.8	140.5
*	3.958	-828.3	-0.0	27.6	6.0	141.2
*	4.208	-887.7	-0.0	29.0	8.3	141.4
*	4.458	-948.6	-0.0	31.1	11.6	142.0
*	4.708	-1008.1	-0.0	34.0	15.4	142.2
*	4.958	-1067.2	-0.0	38.7	20.0	142.2
*	5.208	-1128.0	-0.0	44.2	25.3	141.9
*	5.458	-1187.4	-0.0	50.8	30.8	141.8
*	5.708	-1246.6	-0.0	58.2	36.1	141.5
*	5.958	-1305.0	-0.0	69.3	41.8	141.0
*	6.208	-1365.7	-0.0	80.4	47.1	140.4
*	6.458	-1421.7	-0.0	92.6	51.8	139.5
*	6.708	-1479.3	-0.0	106.6	56.2	138.8
*	6.958	-1535.1	-0.0	121.2	60.4	137.6
*	7.208	-1590.6	-0.0	136.7	64.4	136.3
*	7.458	-1646.6	-0.0	153.4	67.3	135.2
*	7.708	-1699.7	-0.0	170.9	69.8	134.2

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1075-MAY-66 STA 82

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
7.958	-1752.8	-0.0	189.3	71.7	133.0
8.208	-1800.5	-0.0	206.9	72.2	132.1
8.458	-1859.5	-0.0	225.4	71.9	131.3
8.708	-1910.1	-0.0	243.9	71.1	130.3
8.958	-1969.3	-0.0	261.2	70.6	129.2
9.208	-2014.1	-0.0	278.5	69.7	128.1
9.458	-2065.0	-0.0	295.6	69.2	127.1
9.708	-2115.6	-0.0	313.3	69.2	125.9
9.958	-2165.3	-0.0	330.4	69.1	124.7
10.208	-2215.2	-0.0	347.7	69.0	124.1
10.458	-2252.0	-0.0	364.7	68.7	123.6
10.708	-2318.5	-0.0	382.1	68.3	122.8
10.958	-2362.7	-0.0	399.2	67.3	121.6
11.208	-2411.2	-0.0	416.2	66.8	121.0
11.458	-2458.0	-0.0	432.6	66.5	119.4
11.708	-2508.0	-0.0	448.3	65.7	118.2
11.958	-2552.7	-0.0	465.3	65.1	117.4
12.208	-2597.1	-0.0	482.4	64.7	116.7
12.458	-2646.0	-0.0	497.5	64.1	115.7
12.708	-2692.0	-0.0	513.5	63.2	114.9
12.958	-2736.9	-0.0	529.2	62.3	114.1
13.208	-2781.9	-0.0	544.8	62.0	113.4
13.458	-2827.9	-0.0	560.7	61.1	112.5
13.708	-2872.2	-0.0	575.4	60.3	111.9
13.958	-2917.1	-0.0	590.5	59.1	111.0
14.208	-2961.1	-0.0	604.9	58.0	110.2
14.458	-3005.1	-0.0	619.8	56.9	109.7
14.708	-3048.9	-0.0	633.4	55.3	109.1
14.958	-3098.1	-0.0	647.6	54.2	108.8
15.208	-3136.9	-0.0	660.6	52.5	108.2
15.458	-3180.5	-0.0	673.1	51.5	107.6
15.708	-3224.2	-0.0	686.8	50.9	107.1
15.958	-3267.2	-0.0	698.3	49.5	106.4
16.208	-3310.0	-0.0	711.0	48.2	106.1
16.458	-3358.6	-0.0	723.3	46.4	106.2
16.708	-3395.5	-0.0	734.4	44.5	106.1
16.958	-3440.0	-0.0	745.5	42.8	105.7
17.208	-3484.4	-0.0	755.8	38.9	105.1
17.458	-3526.8	-0.0	766.0	38.3	104.7
17.708	-3569.7	-0.0	774.3	33.5	103.9
17.958	-3612.3	-0.0	781.0	31.1	103.7
18.208	-3655.9	-0.0	789.3	29.2	103.9

16-MAY-66 NORTH AD SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1115 FLT 47

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-3.393	790.9	-0.0	51.7	-19.4	131.6
*	-3.143	735.2	-0.0	46.8	-19.9	131.9
*	-2.893	679.7	-0.0	41.3	-20.0	132.4
*	-2.643	624.6	-0.0	36.3	-19.6	132.8
*	-2.393	568.2	-0.0	31.9	-18.8	133.1
*	-2.143	511.8	-0.0	27.3	-18.3	133.3
*	-1.893	456.1	-0.0	22.1	-17.4	133.8
*	-1.643	399.4	-0.0	18.6	-16.0	134.0
*	-1.393	342.8	-0.0	13.7	-14.0	134.3
*	-1.143	286.3	-0.0	10.6	-11.7	134.6
*	-0.893	229.5	-0.0	8.6	-9.7	134.7
*	-0.643	172.6	-0.0	6.4	-7.5	134.9
*	-0.393	116.1	-0.0	4.6	-5.6	135.0
*	-0.143	59.3	-0.0	3.5	-4.0	134.9
*	0.107 0.294	1.8	-0.0	2.3	-2.4	134.7
*	0.357	-55.6	-0.0	2.6	-1.4	135.0
*	0.607	-111.5	-0.0	2.4	-1.0	134.9
*	0.857	-167.7	-0.0	2.6	-1.0	135.3
*	1.107	-226.4	-0.0	1.8	-0.8	135.9
*	1.357	-282.6	-0.0	1.6	0.8	136.5
*	1.607	-341.4	-0.0	1.0	3.8	136.7
*	1.857	-399.0	-0.0	2.0	7.4	136.5
*	2.107	-456.6	-0.0	4.9	11.8	136.3
*	2.357	-513.7	-0.0	9.3	15.1	135.9
*	2.607	-571.1	-0.0	12.7	17.0	135.8
*	2.857	-627.4	-0.0	18.8	17.6	136.0
*	3.107	-685.3	-0.0	22.5	17.9	136.3
*	3.357	-742.1	-0.0	26.8	18.3	136.7
*	3.607	-800.2	-0.0	31.0	18.7	137.0
*	3.857	-857.8	-0.0	36.0	21.0	137.3
*	4.107	-915.8	-0.0	41.0	23.2	137.7
*	4.357	-972.9	-0.0	47.1	27.4	137.6
*	4.607	-1031.5	-0.0	54.6	31.7	137.7
*	4.857	-1088.9	-0.0	62.9	36.7	137.8
*	5.107	-1145.7	-0.0	72.6	42.0	137.7
*	5.357	-1203.1	-0.0	83.6	47.7	136.9
*	5.607	-1260.0	-0.0	95.2	52.6	136.5
*	5.857	-1315.8	-0.0	110.5	57.2	136.0
*	6.107	-1369.4	-0.0	126.3	61.0	135.4
*	6.357	-1425.7	-0.0	140.8	63.8	134.8
*	6.607	-1479.6	-0.0	158.0	65.9	134.4
*	6.857	-1533.8	-0.0	174.7	67.4	133.9
*	7.107	-1587.5	-0.0	191.6	69.1	133.8
*	7.357	-1640.7	-0.0	209.4	69.9	132.1
*	7.607	-1693.6	-0.0	225.6	70.8	131.4
*	7.857	-1744.9	-0.0	244.6	71.7	130.4
*	8.107	-1797.7	-0.0	262.9	72.1	130.0
*	8.357	-1849.1	-0.0	280.8	72.5	128.8
*	8.607	-1899.5	-0.0	299.3	72.5	127.8
*	8.857	-1951.0	-0.0	317.2	72.3	126.2
*	9.107	-1999.7	-0.0	335.3	72.2	125.0
*	9.357	-2050.0	-0.0	353.5	71.8	124.0

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1115-MAY-66 STA 82

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	9.607	-2097.7	-0.0	371.2	71.6	122.6
*	9.857	-2146.9	-0.0	389.2	71.5	122.1
*	10.107	-2195.5	-0.0	407.0	71.0	120.9
*	10.357	-2242.1	-0.0	424.6	70.9	120.0
*	10.607	-2289.9	-0.0	442.9	70.7	119.1
*	10.857	-2336.6	-0.0	459.5	70.2	118.2
*	11.107	-2382.4	-0.0	477.9	69.6	117.3
*	11.357	-2429.8	-0.0	495.2	68.6	116.3
*	11.607	-2475.3	-0.0	512.0	68.6	115.9
*	11.857	-2519.7	-0.0	528.9	67.6	114.8
*	12.107	-2565.7	-0.0	545.4	67.3	113.7
*	12.357	-2611.8	-0.0	563.2	67.2	113.0
*	12.607	-2654.6	-0.0	579.0	67.3	112.6
*	12.857	-2699.1	-0.0	596.0	66.5	111.4
*	13.107	-2742.5	-0.0	612.9	65.5	110.8
*	13.357	-2787.2	-0.0	629.9	64.7	110.5

19-MAY-66 NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1129 FLT No. 49

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-5.184	1290.1	-0.0	118.9	-14.0	140.4
*	-4.934	1232.5	-0.0	116.0	-18.2	140.7
*	-4.684	1173.0	-0.0	110.3	-22.3	141.1
*	-4.434	1113.8	-0.0	103.4	-25.8	141.3
*	-4.184	1054.2	-0.0	96.1	-28.2	142.0
*	-3.934	994.3	-0.0	89.2	-28.8	142.2
*	-3.684	935.2	-0.0	81.3	-29.2	142.6
*	-3.434	875.9	-0.0	74.3	-28.9	142.8
*	-3.184	815.3	-0.0	67.4	-28.8	143.0
*	-2.934	755.1	-0.0	59.4	-28.6	143.4
*	-2.684	695.4	-0.0	53.3	-28.7	143.3
*	-2.434	635.4	-0.0	45.6	-28.6	143.5
*	-2.184	574.7	-0.0	38.4	-28.3	143.7
*	-1.934	514.9	-0.0	31.3	-27.9	143.9
*	-1.684	454.7	-0.0	24.3	-26.2	144.0
*	-1.434	393.5	-0.0	17.5	-24.1	143.8
*	-1.184	333.7	-0.0	11.7	-21.1	143.6
*	-0.934	272.8	-0.0	7.0	-16.7	143.1
*	-0.684	212.9	-0.0	2.6	-11.5	142.4
*	-0.434	153.0	-0.0	0.2	-6.0	142.0
*	-0.184	93.0	-0.0	-0.0	-1.2	141.7
*	0.066 0.239	33.6	-0.0	0.8	1.5	141.5
*	0.316	-25.9	-0.0	2.7	2.7	141.3
*	0.566	-86.1	-0.0	3.9	2.3	139.1
*	0.816	-145.1	-0.0	2.8	0.8	140.0
*	1.066	-204.8	-0.0	3.5	-0.7	140.6
*	1.316	-255.9	-0.0	3.6	-1.1	141.5
*	1.566	-324.8	-0.0	2.3	-1.2	142.8
*	1.816	-383.6	-0.0	1.8	-1.6	144.5
*	2.066	-444.5	-0.0	2.4	-1.2	145.6
*	2.316	-505.3	-0.0	1.4	0.0	142.9
*	2.566	-567.6	-0.0	1.2	1.2	142.9
*	2.816	-627.1	-0.0	1.7	1..	142.6
*	3.066	-684.2	-0.0	2.9	1.8	142.2
*	3.316	-745.9	-0.0	4.2	1.6	141.9
*	3.566	-806.9	-0.0	3.5	1.2	142.6
*	3.816	-866.0	-0.0	3.1	0.2	143.2
*	4.066	-926.3	-0.0	3.7	-0.3	143.3
*	4.316	-987.1	-0.0	4.3	-0.3	142.6
*	4.566	-1047.5	-0.0	3.2	-0.4	144.3
*	4.816	-1109.4	-0.0	3.2	-0.2	144.6
*	5.066	-1170.0	-0.0	2.9	0.7	144.7
*	5.316	-1231.1	-0.0	3.1	2.6	144.9
*	5.566	-1292.4	-0.0	4.2	4.7	145.3
*	5.816	-1353.3	-0.0	5.3	6.8	145.8
*	6.066	-1414.7	-0.0	7.5	9.4	146.1
*	6.316	-1477.6	-0.0	10.4	11.8	146.5
*	6.566	-1538.8	-0.0	12.9	14.9	146.8
*	6.816	-1600.5	-0.0	17.6	17.9	147.2
*	7.066	-1662.8	-0.0	21.8	20.8	147.6
*	7.316	-1724.2	-0.0	28.0	23.7	147.9
*	7.566	-1787.4	-0.0	34.7	25.8	147.9

NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1129-MAY-66 STA 62

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
7.816	-1849.7	-0.0	41.1	28.3	147.5
8.066	-1910.9	-0.0	43.3	30.4	147.0
8.316	-1972.4	-0.0	55.9	32.9	146.3
8.566	-2033.0	-0.0	65.1	36.0	145.9
8.816	-2094.2	-0.0	73.7	38.2	145.7
9.066	-2154.8	-0.0	84.1	40.4	145.5
9.316	-2215.0	-0.0	95.1	42.1	145.1
9.566	-2275.8	-0.0	105.1	43.7	144.8
9.816	-2335.6	-0.0	116.3	44.8	144.1
10.066	-2394.6	-0.0	127.8	46.2	143.6
10.316	-2454.3	-0.0	139.5	47.9	143.1
10.566	-2513.5	-0.0	151.5	49.3	142.8
10.816	-2571.9	-0.0	164.1	51.1	142.1
11.066	-2630.8	-0.0	177.0	52.7	141.5
11.316	-2689.6	-0.0	190.5	54.1	141.0
11.566	-2745.6	-0.0	204.5	55.1	140.6
11.816	-2803.9	-0.0	218.4	55.4	140.2
12.066	-2861.4	-0.0	232.4	55.4	140.1
12.316	-2918.7	-0.0	246.5	55.1	140.2
12.566	-2976.3	-0.0	259.6	54.7	139.8
12.816	-3034.0	-0.0	273.8	54.4	139.1
13.066	-3090.9	-0.0	287.1	54.0	138.4
13.316	-3147.3	-0.0	300.6	53.9	137.7
13.566	-3203.6	-0.0	314.1	53.4	137.3
13.816	-3259.8	-0.0	327.4	53.7	137.0
14.066	-3315.8	-0.0	340.7	53.6	136.4
14.316	-3372.5	-0.0	353.8	53.9	136.2
14.566	-3427.9	-0.0	368.0	54.7	135.6
14.816	-3482.7	-0.0	380.9	55.3	135.3
15.066	-3539.0	-0.0	394.9	55.6	135.1
15.316	-3592.6	-0.0	409.7	55.2	134.7
15.566	-3649.1	-0.0	423.4	55.3	134.1
15.816	-3704.4	-0.0	436.9	54.6	133.8
16.066	-3758.2	-0.0	450.1	54.0	133.8
16.316	-3811.6	-0.0	464.1	53.9	133.2
16.566	-3868.1	-0.0	477.1	53.3	133.2
16.816	-3922.4	-0.0	490.9	53.1	132.5
17.066	-3976.5	-0.0	504.2	52.8	131.8
17.316	-4031.3	-0.0	516.4	53.0	130.6
17.566	-4082.6	-0.0	530.0	53.1	129.7
17.816	-4135.8	-0.0	543.5	53.2	128.9
18.066	-4189.5	-0.0	557.0	52.8	128.4
18.316	-4241.3	-0.0	570.5	52.4	128.8
18.566	-4293.0	-0.0	583.2	51.0	128.4
18.816	-4346.5	-0.0	594.7	50.0	128.3
19.066	-4400.1	-0.0	609.4	49.0	128.0

01-JUN-66 NORTH 40 SPACE POSITIONING PROGRAM FLT 56
LIC 5055 DROP NUMBER 1236

*	TIME	X	Y	ALT	R/C	TOTAL VELOCITY
*	SECONDS	FEET	FEET	FEET	FT/SEC	KNOTS
*	-4.594	1114.0	-0.0	46.8	-22.2	132.4
*	-4.344	1058.0	-0.0	41.8	-19.3	132.2
*	-4.094	1002.8	-0.0	36.4	-16.8	131.9
*	-3.844	947.0	-0.0	32.3	-15.1	131.6
*	-3.594	891.9	-0.0	30.2	-13.4	131.4
*	-3.344	836.4	-0.0	26.5	-12.4	131.3
*	-3.094	781.4	-0.0	23.8	-12.9	131.1
*	-2.844	726.1	-0.0	20.8	-12.1	130.9
*	-2.594	670.8	-0.0	17.3	-11.0	130.8
*	-2.344	615.9	-0.0	12.7	-10.2	130.9
*	-2.094	561.0	-0.0	13.2	-9.4	130.7
*	-1.844	505.6	-0.0	10.6	-8.2	130.6
*	-1.594	450.1	-0.0	8.2	-7.4	130.4
*	-1.344	396.0	-0.0	5.7	-7.6	130.3
*	-1.094	340.6	-0.0	4.6	-5.6	129.7
*	-0.844	286.0	-0.0	2.8	-4.0	129.5
*	-0.594	230.9	-0.0	1.9	-2.3	129.2
*	-0.344	177.7	-0.0	2.7	-1.5	129.1
*	-0.094	122.4	-0.0	1.7	-1.2	129.0
*	0.156 ~~0.378~~	68.7	-0.0	2.3	-1.5	129.1
*	0.406	13.0	-0.0	1.5	-2.4	129.1
*	0.656	-40.5	-0.0	0.4	-3.0	128.7
*	0.906	-95.4	-0.0	0.1	-3.2	129.0
*	1.156	-149.2	-0.0	-1.2	-2.8	128.8
*	1.406	-202.9	-0.0	-2.6	-2.4	129.2
*	1.656	-259.2	-0.0	-1.9	-1.4	129.1
*	1.906	-312.5	-0.0	-2.7	-0.5	129.1
*	2.156	-367.9	-0.0	-3.2	0.0	129.0
*	2.406	-421.8	-0.0	-1.7	-1.5	128.3
*	2.656	-475.4	-0.0	-2.6	-2.3	129.3
*	2.906	-530.6	-0.0	-2.4	-2.8	128.5
*	3.156	-583.4	-0.0	-5.8	-3.2	126.9
*	3.406	-641.9	-0.0	-6.0	-2.2	124.7
*	3.656	-691.0	-0.0	-5.9	-1.2	122.4
*	3.906	-740.6	-0.0	-5.7	1.4	126.0
*	4.156	-790.8	-0.0	-5.6	2.4	128.7
*	4.406	-841.5	-0.0	-5.4	2.8	132.2
*	4.656	-913.3	-0.0	-3.0	3.2	135.2
*	4.906	-966.7	-0.0	-2.5	3.2	134.7
*	5.156	-1020.1	-0.0	-2.3	2.5	131.2
*	5.406	-1078.5	-0.0	-1.5	0.9	126.7
*	5.656	-1127.8	-0.0	-0.9	0.6	121.2
*	5.906	-1177.9	-0.0	-1.3	-0.4	123.2
*	6.156	-1235.6	-0.0	-2.2	-0.7	125.3
*	6.406	-1267.1	-0.0	-1.2	-0.1	128.2
*	6.656	-1343.7	-0.0	-3.0	1.8	130.3
*	6.906	-1398.4	-0.0	-1.8	4.8	131.7
*	7.156	-1449.6	-0.0	-0.5	6.6	134.4
*	7.406	-1504.4	-0.0	2.0	9.8	129.0
*	7.656	-1560.5	-0.0	5.9	11.6	130.7
*	7.906	-1616.4	-0.0	7.0	12.0	132.0
*	8.156	-1668.9	-0.0	11.8	12.9	131.3

NORT. 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1236-JUN-66 STA 82

* TIME	X	Y	ALT	R/C	TOTAL VELOCITY
* SECONDS	FEET	FEET	FEET	FT/SEC	KNOTS
* 8.406	-1728.9	-0.0	15.4	14.1	130.9
* 8.656	-1782.8	-0.0	16.7	16.4	132.2
* 8.906	-1834.9	-0.0	22.2	18.6	134.5
* 9.156	-1891.5	-0.0	27.1	21.8	134.4
* 9.406	-1952.0	-0.0	32.7	25.7	136.1
* 9.656	-2011.8	-0.0	40.1	28.5	136.2
* 9.906	-2064.1	-0.0	47.2	32.0	135.2
* 10.156	-2122.4	-0.0	55.7	35.9	133.3
* 10.406	-2176.0	-0.0	64.7	38.5	132.4
* 10.656	-2232.5	-0.0	75.1	41.9	132.6
* 10.906	-2286.0	-0.0	87.3	45.2	132.0
* 11.156	-2340.9	-0.0	96.7	47.8	132.3
* 11.406	-2394.9	-0.0	110.2	49.9	131.9
* 11.656	-2449.5	-0.0	123.7	51.7	131.7
* 11.906	-2504.1	-0.0	136.3	53.7	131.5
* 12.156	-2557.2	-0.0	149.8	54.1	130.4
* 12.406	-2610.0	-0.0	163.8	55.2	129.4
* 12.656	-2663.9	-0.0	177.6	56.8	128.2
* 12.906	-2714.2	-0.0	191.5	57.9	127.6
* 13.156	-2767.0	-0.0	206.5	58.9	131.1
* 13.406	-2816.9	-0.0	221.9	60.1	129.2
* 13.656	-2868.8	-0.0	236.5	61.1	127.4
* 13.906	-2936.7	-0.0	251.9	61.6	125.2
* 14.156	-2970.7	-0.0	267.6	60.4	122.2
* 14.406	-3019.4	-0.0	283.2	61.0	120.0
* 14.656	-3069.5	-0.0	298.9	60.4	113.5

NORTH 40 SPACE POSITIONING PROGRAM FLT 57
LIC 5055 DROP NUMBER 1237-JUN-66 STA 82

#	TIME	X	Y	ALT	R/C	TOTAL VELOCITY
#	SECONDS	FEET	FEET	FEET	FT/SEC	KNOTS
#	-10.500	1370.9	-0.0	98.7	-10.2	125.7
#	-10.250	1318.1	-0.0	95.3	-13.6	125.8
#	-10.000	1265.6	-0.0	91.7	-16.7	125.8
#	-9.750	1212.6	-0.0	87.3	-20.0	126.0
#	-9.500	1159.5	-0.0	80.9	-21.9	126.2
#	-9.250	1106.7	-0.0	75.4	-22.0	126.2
#	-9.000	1053.3	-0.0	69.1	-21.3	126.0
#	-8.750	1000.7	-0.0	63.4	-19.3	126.0
#	-8.500	948.0	-0.0	60.4	-18.5	125.9
#	-8.250	895.1	-0.0	55.4	-18.4	125.9
#	-8.000	841.5	-0.0	52.0	-18.6	126.0
#	-7.750	789.0	-0.0	46.2	-19.0	126.1
#	-7.500	736.1	-0.0	40.3	-18.4	126.0
#	-7.250	682.9	-0.0	36.5	-19.0	126.1
#	-7.000	629.8	-0.0	32.5	-17.9	126.2
#	-6.750	577.2	-0.0	28.6	-17.1	126.1
#	-6.500	523.7	-0.0	22.1	-16.5	126.1
#	-6.250	470.8	-0.0	19.2	-15.4	126.1
#	-6.000	417.9	-0.0	15.3	-14.0	126.1
#	-5.750	364.5	-0.0	12.5	-12.4	125.8
#	-5.500	311.5	-0.0	9.6	-12.0	125.5
#	-5.250	258.7	-0.0	6.6	-10.8	125.4
#	-5.000	206.1	-0.0	3.4	-9.7	125.1
#	-4.750	153.7	-0.0	1.2	-8.1	125.0
#	-4.500	100.5	-0.0	-0.4	-5.8	125.1
#	-4.250	48.2	-0.0	-1.8	-4.0	125.2
#	-4.000	-4.8	-0.0	-2.3	-2.6	125.3
#	-3.750	-57.9	-0.0	-2.2	-1.1	125.1
#	-3.500	-110.6	-0.0	-3.0	-0.7	125.1
#	-3.250	-163.6	-0.0	-2.9	-1.2	124.7
#	-3.000	-215.7	-0.0	-2.0	-1.1	124.4
#	-2.750	-268.8	-0.0	-3.4	-1.0	124.2
#	-2.500	-320.3	-0.0	-4.6	-1.4	124.0
#	-2.250	-373.1	-0.0	-3.5	-1.8	123.9
#	-2.000	-425.2	-0.0	-4.2	-1.2	123.7
#	-1.750	-477.6	-0.0	-4.7	-0.0	123.6
#	-1.500	-529.4	-0.0	-5.5	0.4	123.1
#	-1.250	-581.7	-0.0	-5.3	3.3	123.1
#	-1.000	-633.1	-0.0	-3.0	5.2	123.2
#	-0.750	-684.6	-0.0	-3.3	5.2	123.5
#	-0.500	-737.4	-0.0	1.9	4.0	124.0
#	-0.250	-789.6	-0.0	1.8	1.5	124.6
#	0.000	-842.7	-0.0	0.2	-0.6	125.2
#	0.250	-895.3	-0.0	0.1	-3.5	125.7
#	0.500	-948.1	-0.0	-1.2	-2.8	126.5
#	0.750	-1001.9	-0.0	-2.0	-1.9	126.8
#	1.000	-1055.8	-0.0	-3.2	-0.1	127.8
#	1.250	-1110.3	-0.0	-1.7	4.9	128.7
#	1.500	-1162.8	-0.0	-2.3	8.4	129.5
#	1.750	-1219.2	-0.0	0.5	11.9	130.3
#	2.000	-1274.4	-0.0	6.2	14.6	130.9
#	2.250	-1329.3	-0.0	10.5	19.1	131.8

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1237-JUN-66 STA 82

* TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
* 2.500	-1364.9	-0.0	13.6	21.5	131.6
* 2.750	-1440.0	-0.0	18.4	25.1	131.4
* 3.000	-1495.9	-0.0	27.9	30.1	131.5
* 3.250	-1550.5	-0.0	33.6	33.1	131.4
* 3.500	-1604.0	-0.0	44.6	35.5	131.4
* 3.750	-1659.6	-0.0	54.9	38.0	131.3
* 4.000	-1714.0	-0.0	61.0	40.5	131.7
* 4.250	-1769.0	-0.0	71.9	41.5	131.6
* 4.500	-1823.1	-0.0	85.4	45.9	131.0
* 4.750	-1877.8	-0.0	95.2	49.3	130.6
* 5.000	-1931.3	-0.0	106.4	52.6	130.2
* 5.250	-1983.1	-0.0	123.9	55.8	129.7
* 5.500	-2036.4	-0.0	134.4	59.8	129.1
* 5.750	-2089.4	-0.0	152.5	62.3	128.3
* 6.000	-2140.8	-0.0	168.0	63.4	127.6
* 6.250	-2191.7	-0.0	184.1	65.1	126.8
* 6.500	-2241.4	-0.0	200.5	65.0	125.1
* 6.750	-2292.5	-0.0	217.3	66.7	124.6
* 7.000	-2340.7	-0.0	232.3	67.8	123.8
* 7.250	-2391.2	-0.0	250.1	68.4	122.8
* 7.500	-2440.0	-0.0	269.0	69.4	121.7
* 7.750	-2487.6	-0.0	285.7	70.3	120.8
* 8.000	-2534.9	-0.0	302.3	70.7	119.5
* 8.250	-2581.9	-0.0	320.7	71.3	118.6
* 8.500	-2628.6	-0.0	338.2	72.5	117.8
* 8.750	-2674.7	-0.0	357.2	73.8	117.1
* 9.000	-2720.4	-0.0	375.8	74.7	115.9
* 9.250	-2765.0	-0.0	393.7	75.2	114.9
* 9.500	-2810.1	-0.0	413.3	73.4	113.7
* 9.750	-2852.8	-0.0	432.7	73.3	113.1
* 10.000	-2897.2	-0.0	450.7	73.0	112.5
* 10.250	-2941.4	-0.0	465.6	71.4	111.5
* 10.500	-2984.9	-0.0	486.3	70.8	111.1
* 10.750	-3027.9	-0.0	504.4	69.5	109.9
* 11.000	-3070.5	-0.0	520.4	68.6	108.9
* 11.250	-3113.6	-0.0	538.6	65.7	107.4
* 11.500	-3155.4	-0.0	552.8	63.2	106.3
* 11.750	-3197.1	-0.0	569.9	61.0	105.2
* 12.000	-3238.1	-0.0	585.2	59.1	104.0
* 12.250	-3280.0	-0.0	598.3	58.0	103.3

NORTH 40 SPACE POSITIONING PROGRAM FLT 58

LIC 5055 DROP NUMBER 1238-JUN-66 STA 82

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-7.368	1613.6	-0.0	104.9	-1.7	127.6
*	-7.118	1560.1	-0.0	104.2	-2.6	127.6
*	-6.868	1506.2	-0.0	103.7	-4.3	127.6
*	-6.618	1452.3	-0.0	102.6	-6.6	127.6
*	-6.368	1398.5	-0.0	100.5	-9.0	127.8
*	-6.118	1345.0	-0.0	98.2	-11.6	127.9
*	-5.868	1290.8	-0.0	94.6	-13.9	128.1
*	-5.618	1236.6	-0.0	90.7	-16.0	128.3
*	-5.368	1182.9	-0.0	86.4	-17.7	128.5
*	-5.118	1128.7	-0.0	82.1	-18.9	128.7
*	-4.868	1074.8	-0.0	76.6	-20.2	128.9
*	-4.618	1020.5	-0.0	71.7	-20.7	129.2
*	-4.368	966.1	-0.0	66.4	-21.2	129.4
*	-4.118	911.9	-0.0	60.3	-21.1	129.7
*	-3.868	857.2	-0.0	56.0	-20.8	129.8
*	-3.618	802.6	-0.0	50.1	-19.9	129.8
*	-3.368	748.0	-0.0	45.3	-18.7	129.9
*	-3.118	693.6	-0.0	40.7	-17.7	129.8
*	-2.868	639.1	-0.0	36.7	-16.7	130.0
*	-2.618	584.0	-0.0	32.6	-16.2	130.0
*	-2.368	529.6	-0.0	29.3	-15.6	130.1
*	-2.118	474.2	-0.0	24.5	-15.0	130.1
*	-1.868	420.4	-0.0	20.7	-14.4	130.2
*	-1.618	364.9	-0.0	17.6	-13.2	121.8
*	-1.368	310.2	-0.0	14.6	-11.9	124.5
*	-1.118	255.2	-0.0	11.1	-10.5	127.3
*	-0.868	233.8	-0.0	9.3	-9.5	129.9
*	-0.618	145.5	-0.0	6.4	-8.2	132.9
*	-0.368	91.2	-0.0	5.5	-6.6	135.7
*	-0.118 0.050	36.2	-0.0	3.2	-5.4	138.7
*	0.132	-19.3	-0.0	2.1	-3.7	130.3
*	0.382	-73.9	-0.0	1.6	-2.7	130.4
*	0.632	-129.0	-0.0	1.2	-1.5	130.3
*	0.882	-184.2	-0.0	1.3	-0.9	130.1
*	1.132	-238.8	-0.0	0.8	-0.5	130.3
*	1.382	-293.7	-0.0	0.7	-0.2	130.3
*	1.632	-348.7	-0.0	0.8	-0.1	130.3
*	1.882	-403.9	-0.0	0.8	0.0	130.4
*	2.132	-458.9	-0.0	1.0	0.1	130.5
*	2.382	-513.9	-0.0	0.9	0.4	130.5
*	2.632	-568.8	-0.0	0.8	1.7	130.7
*	2.882	-624.0	-0.0	1.0	3.0	130.7
*	3.132	-679.2	-0.0	1.7	4.9	131.2
*	3.382	-734.9	-0.0	4.1	7.8	131.4
*	3.632	-789.6	-0.0	5.5	11.2	131.7
*	3.882	-846.2	-0.0	8.2	14.4	132.3
*	4.132	-901.1	-0.0	12.9	17.5	132.5
*	4.382	-957.0	-0.0	18.3	21.6	132.6
*	4.632	-1013.6	-0.0	23.5	25.2	132.5
*	4.882	-1068.9	-0.0	29.6	28.9	132.5
*	5.132	-1123.4	-0.0	38.0	33.0	132.3
*	5.382	-1179.0	-0.0	46.5	38.4	132.1

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1238-JUN-66 STA 82

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
5.632	-1234.0	-0.0	56.8	43.3	131.8
5.882	-1288.7	-0.0	67.4	48.2	131.6
6.132	-1342.9	-0.0	81.6	52.7	131.0
6.382	-1395.3	-0.0	94.5	56.8	130.3
6.632	-1449.1	-0.0	110.2	60.4	129.8
6.882	-1501.0	-0.0	124.7	63.0	129.4
7.132	-1552.8	-0.0	141.5	65.1	128.9
7.382	-1604.8	-0.0	158.4	90.5	133.3
7.632	-1656.5	-0.0	175.5	85.4	131.2
7.882	-1706.8	-0.0	191.8	79.1	128.8
8.132	-1757.9	-0.0	265.4	73.0	126.4
8.382	-1807.3	-0.0	230.2	67.0	124.2
8.632	-1856.6	-0.0	248.4	60.1	122.1
8.882	-1905.7	-0.0	267.5	52.0	119.7
9.132	-1954.3	-0.0	287.0	75.4	123.2
9.382	-2002.9	-0.0	305.2	75.7	122.4
9.632	-2050.3	-0.0	323.9	74.5	121.4
9.882	-2098.1	-0.0	343.3	73.2	120.3
10.132	-2145.1	-0.0	362.1	71.8	119.0
10.382	-2192.4	-0.0	378.5	70.1	118.0
10.632	-2238.5	-0.0	396.2	67.7	116.5
10.882	-2283.6	-0.0	412.8	66.5	115.5
11.132	-2330.5	-0.0	429.7	65.8	114.7
11.382	-2375.0	-0.0	444.7	64.6	114.4
11.632	-2420.2	-0.0	462.1	63.7	113.6
11.882	-2465.7	-0.0	477.4	62.7	112.5
12.132	-2511.7	-0.0	493.1	62.5	111.8
12.382	-2554.8	-0.0	508.1	61.3	110.7
12.632	-2598.5	-0.0	523.3	61.3	109.9
12.882	-2641.8	-0.0	539.5	60.8	109.2
13.132	-2685.5	-0.0	553.8	60.2	108.7
13.382	-2729.3	-0.0	569.6	58.7	106.6
13.632	-2772.3	-0.0	583.7	57.4	105.9

FLT 59

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1263-JUN-66 STA 82

*	TIME	X	Y	ALT	R/C	TOTAL VELOCITY
*	SECONDS	FEET	FEET	FEET	FT/SEC	KNOTS
*	-10.057	1909.5	-0.0	96.0	-1.1	108.3
*	-9.807	1863.8	-0.0	97.4	0.1	108.1
*	-9.557	1818.4	-0.0	96.0	0.8	108.1
*	-9.307	1773.1	-0.0	95.9	1.5	108.1
*	-9.057	1727.4	-0.0	98.2	1.5	108.0
*	-8.807	1681.1	-0.0	97.6	1.4	108.1
*	-8.557	1636.1	-0.0	98.7	0.3	108.0
*	-8.307	1590.5	-0.0	98.6	-0.9	107.7
*	-8.057	1544.9	-0.0	97.4	-2.0	107.7
*	-7.807	1499.8	-0.0	96.8	-2.9	108.1
*	-7.557	1454.5	-0.0	97.0	-5.3	108.1
*	-7.307	1408.4	-0.0	94.7	-6.8	108.3
*	-7.057	1362.1	-0.0	92.5	-9.1	108.6
*	-6.807	1317.4	-0.0	90.4	-10.7	108.8
*	-6.557	1271.1	-0.0	87.3	-11.7	109.0
*	-6.307	1225.1	-0.0	83.5	-12.7	109.2
*	-6.057	1179.2	-0.0	81.1	-13.8	109.7
*	-5.807	1132.6	-0.0	77.1	-14.2	109.8
*	-5.557	1087.0	-0.0	73.6	-14.8	110.0
*	-5.307	1040.2	-0.0	69.5	-15.9	110.3
*	-5.057	993.8	-0.0	66.1	-16.5	110.6
*	-4.807	947.6	-0.0	61.7	-17.2	110.8
*	-4.557	900.9	-0.0	56.9	-17.6	110.9
*	-4.307	853.7	-0.0	52.5	-18.1	111.0
*	-4.057	808.0	-0.0	47.9	-18.0	111.2
*	-3.807	760.8	-0.0	43.7	-17.1	111.2
*	-3.557	714.2	-0.0	39.8	-16.7	111.2
*	-3.307	667.2	-0.0	34.7	-15.6	111.8
*	-3.057	620.5	-0.0	31.9	-14.3	111.6
*	-2.807	573.7	-0.0	27.2	-13.2	111.7
*	-2.557	525.0	-0.0	24.9	-12.7	111.8
*	-2.307	479.7	-0.0	22.2	-12.1	111.8
*	-2.057	432.0	-0.0	18.6	-11.7	111.4
*	-1.807	384.7	-0.0	15.5	-11.5	111.2
*	-1.557	338.1	-0.0	13.5	-11.2	111.4
*	-1.307	292.1	-0.0	9.8	-10.4	111.1
*	-1.057	244.3	-0.0	8.0	-9.8	111.3
*	-0.807	197.8	-0.0	5.0	-10.0	111.3
*	-0.557	151.2	-0.0	3.3	-9.1	111.3
*	-0.307	103.2	-0.0	1.2	-7.3	111.2
*	-0.057	57.4	-0.0	-2.4	-4.7	111.4
*	0.193	10.4	-0.0	-3.2	-3.1	111.7
*	0.443	-37.1	-0.0	-1.6	-0.8	111.4
*	0.693	-84.4	-0.0	-1.4	0.4	111.8
*	0.943	-131.9	-0.0	-2.5	-0.1	111.5
*	1.193	-177.7	-0.0	-1.2	-0.6	111.8
*	1.443	-225.7	-0.0	-2.5	-0.6	112.1
*	1.693	-271.9	-0.0	-2.8	-0.5	112.3
*	1.943	-320.9	-0.0	-2.1	-0.5	112.7
*	2.193	-368.4	-0.0	-2.5	0.3	112.6
*	2.443	-415.3	-0.0	-2.9	0.4	112.5
*	2.693	-463.1	-0.0	-2.3	0.0	112.2

0.136

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1263-JUN-66 STA 82

*	TIME	X	Y	ALT	R/C	TOTAL VELOCITY
*	SECONDS	FEET	FEET	FEET	FT/SEC	KNOTS
*	2.943	-510.3	-0.0	-1.8	0.2	112.2
*	3.193	-557.2	-0.0	-2.1	-0.4	112.1
*	3.443	-605.1	-0.0	-2.6	-0.8	111.9
*	3.693	-652.4	-0.0	-2.4	1.4	113.0
*	3.943	-699.0	-0.0	-3.5	4.1	113.9
*	4.193	-746.4	-0.0	-3.0	7.4	114.7
*	4.443	-797.8	-0.0	2.4	9.4	114.9
*	4.693	-845.7	-0.0	4.4	11.9	115.4
*	4.943	-894.5	-0.0	8.1	12.3	115.3
*	5.193	-941.1	-0.0	9.4	11.9	114.7
*	5.443	-990.5	-0.0	14.0	12.6	115.4
*	5.693	-1039.4	-0.0	16.9	13.2	115.9
*	5.943	-1087.6	-0.0	20.0	14.8	116.5
*	6.193	-1137.6	-0.0	23.3	15.7	116.9
*	6.443	-1186.5	-0.0	27.5	18.0	117.0
*	6.693	-1235.2	-0.0	32.8	21.6	117.5
*	6.943	-1285.8	-0.0	37.4	25.2	117.5
*	7.193	-1333.5	-0.0	44.1	28.6	117.8
*	7.443	-1383.9	-0.0	53.3	32.0	117.8
*	7.693	-1432.3	-0.0	61.2	35.4	117.9
*	7.943	-1481.7	-0.0	70.1	38.1	118.0
*	8.193	-1529.7	-0.0	79.9	40.2	115.6
*	8.443	-1579.4	-0.0	90.6	42.8	116.7
*	8.693	-1614.9	-0.0	101.9	44.7	117.0
*	8.943	-1675.3	-0.0	113.1	47.2	117.4
*	9.193	-1723.6	-0.0	125.0	49.4	118.0
*	9.443	-1769.1	-0.0	137.0	51.4	118.3
*	9.693	-1816.1	-0.0	151.5	53.0	114.4
*	9.943	-1864.0	-0.0	164.8	54.0	113.8
*	10.193	-1908.2	-0.0	178.6	54.9	113.4
*	10.443	-1953.6	-0.0	191.8	55.4	112.6
*	10.693	-1999.9	-0.0	205.4	55.4	111.8
*	10.943	-2044.3	-0.0	220.1	55.4	111.3
*	11.193	-2089.6	-0.0	234.8	54.6	110.2
*	11.443	-2133.6	-0.0	247.2	52.9	109.0
*	11.693	-2177.2	-0.0	261.2	52.2	108.2
*	11.943	-2220.7	-0.0	273.0	52.7	107.4
*	12.193	-2264.0	-0.0	284.8	53.7	106.6
*	12.443	-2307.4	-0.0	300.0	54.2	106.1
*	12.693	-2349.4	-0.0	314.6	55.4	105.9
*	12.943	-2390.8	-0.0	327.9	55.3	105.0
*	13.193	-2433.8	-0.0	341.2	54.3	104.4
*	13.443	-2476.3	-0.0	355.3	53.8	103.8
*	13.693	-2516.3	-0.0	368.2	52.9	102.7
*	13.943	-2559.0	-0.0	381.7	51.8	101.8
*	14.193	-2598.7	-0.0	395.3	51.0	100.7
*	14.443	-2638.6	-0.0	406.5	50.7	100.4
*	14.693	-2679.6	-0.0	418.9	49.8	100.2
*	14.943	-2719.0	-0.0	432.2	49.6	100.2
*	15.193	-2759.8	-0.0	445.0	49.6	99.6
*	15.443	-2802.1	-0.0	456.1	48.7	98.8
*	15.693	-2840.3	-0.0	469.4	47.1	97.8

08-JUL-66 NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1302 FLT 61

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-16.080	3515.7	-0.0	112.6	-2.7	129.2
*	-15.830	3462.4	-0.0	112.0	-3.3	127.5
*	-15.580	3467.8	-0.0	110.4	-3.4	127.6
*	-15.330	3354.3	-0.0	110.1	-3.2	127.5
*	-15.080	3300.7	-0.0	109.3	-2.9	127.3
*	-14.830	3246.8	-0.0	108.4	-2.2	127.1
*	-14.580	3193.3	-0.0	108.0	-2.0	127.2
*	-14.330	3140.1	-0.0	107.5	-1.6	127.3
*	-14.080	3086.0	-0.0	107.2	-1.4	127.3
*	-13.830	3031.9	-0.0	107.0	-1.2	127.4
*	-13.580	2978.2	-0.0	106.7	-0.8	127.6
*	-13.330	2924.8	-0.0	106.4	-0.5	127.5
*	-13.080	2870.9	-0.0	106.3	-0.2	127.3
*	-12.830	2816.7	-0.0	106.6	0.5	127.4
*	-12.586	2763.1	-0.0	106.5	1.1	127.5
*	-12.330	2709.8	-0.0	106.5	1.5	127.3
*	-12.080	2655.6	-0.0	107.6	1.8	127.1
*	-11.830	2602.0	-0.0	108.0	1.8	127.1
*	-11.550	2548.7	-0.0	108.5	1.4	127.0
*	-11.330	2495.1	-0.0	108.9	0.7	126.7
*	-11.080	2441.5	-0.0	108.8	0.1	126.7
*	-10.830	2388.2	-0.0	108.7	-0.6	126.6
*	-10.580	2334.9	-0.0	108.6	-1.3	126.4
*	-10.330	2281.3	-0.0	108.3	-1.8	126.4
*	-10.080	2228.2	-0.0	107.7	-2.4	126.4
*	-9.830	2175.1	-0.0	106.9	-2.8	126.4
*	-9.580	2121.6	-0.0	106.1	-3.0	126.4
*	-9.330	2068.2	-0.0	105.3	-3.0	126.4
*	-9.080	2014.9	-0.0	104.6	-2.6	126.4
*	-8.830	1961.6	-0.0	103.8	-2.1	126.2
*	-8.580	1908.5	-0.0	103.3	-1.7	126.0
*	-8.330	1855.0	-0.0	103.1	-0.9	125.8
*	-8.080	1802.3	-0.0	103.1	0.3	125.8
*	-7.830	1749.4	-0.0	102.7	1.1	125.7
*	-7.580	1696.1	-0.0	103.3	2.0	125.5
*	-7.330	1643.0	-0.0	104.7	2.5	125.4
*	-7.080	1590.0	-0.0	104.8	2.5	125.1
*	-6.830	1537.6	-0.0	104.0	1.4	124.8
*	-6.580	1485.1	-0.0	103.1	-0.6	124.7
*	-6.330	1432.6	-0.0	102.2	-2.5	124.7
*	-6.080	1380.0	-0.0	100.1	-5.4	124.9
*	-5.830	1327.1	-0.0	98.1	-7.9	125.1
*	-5.580	1274.5	-0.0	95.2	-10.3	125.2
*	-5.330	1221.3	-0.0	91.8	-12.3	125.3
*	-5.080	1168.6	-0.0	87.6	-13.6	125.5
*	-4.830	1116.0	-0.0	83.0	-15.2	125.7
*	-4.580	1063.3	-0.0	78.6	-16.9	125.9
*	-4.330	1009.7	-0.0	73.4	-18.7	126.3
*	-4.080	957.0	-0.0	78.0	-20.0	126.8
*	-3.830	903.8	-0.0	72.0	-21.5	127.0
*	-3.580	850.2	-0.0	66.4	-22.8	127.1
*	-3.330	796.1	-0.0	61.5	-23.2	127.3

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1302-JUN-66 STA 82

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
-3.080	743.5	-0.0	54.9	-23.2	127.2
-2.830	690.2	-0.0	49.1	-23.2	127.3
-2.580	636.7	-0.0	42.8	-22.6	127.4
-2.330	583.4	-0.0	37.7	-21.4	127.7
-2.080	529.3	-0.0	32.1	-20.4	128.1
-1.830	475.8	-0.0	27.8	-19.6	128.2
-1.580	421.7	-0.0	22.7	-18.6	128.3
-1.330	367.3	-0.0	18.3	-17.3	128.2
-1.080	313.9	-0.0	13.7	-15.5	128.2
-0.830	259.8	-0.0	9.9	-13.4	128.0
-0.580	205.8	-0.0	6.9	-10.9	128.0
-0.330	152.2	-0.0	4.1	-8.1	128.2
-0.080	98.0	-0.0	3.0	-6.0	128.1
0.170	43.6	-0.0	1.7	-4.0	128.1
0.420	-10.5	-0.0	1.2	-2.1	128.3
0.670	-64.0	-0.0	0.5	-0.8	128.3
0.920	-118.5	-0.0	0.6	0.2	128.5
1.170	-172.9	-0.0	1.1	0.8	128.8
1.420	-226.8	-0.0	1.7	0.5	129.0
1.670	-281.9	-0.0	1.6	0.4	129.6
1.920	-336.3	-0.0	1.9	0.5	129.6
2.170	-393.0	-0.0	0.6	0.9	129.4
2.420	-445.8	-0.0	1.8	2.2	129.1
2.670	-500.5	-0.0	2.6	3.4	128.9
2.920	-554.3	-0.0	3.2	4.5	128.3
3.170	-609.0	-0.0	5.3	3.9	129.2
3.420	-663.8	-0.0	6.4	3.5	129.7
3.670	-715.6	-0.0	7.2	2.6	130.6
3.920	-773.9	-0.0	6.8	1.3	131.2
4.170	-828.8	-0.0	7.8	1.2	131.7
4.420	-885.2	-0.0	7.3	2.3	132.6
4.670	-940.6	-0.0	7.5	4.8	132.9
4.920	-996.1	-0.0	8.7	7.1	133.6
5.170	-1053.4	-0.0	11.4	11.2	134.1
5.420	-1110.3	-0.0	15.1	14.8	134.9
5.670	-1166.8	-0.0	17.8	18.5	135.3
5.920	-1223.7	-0.0	24.4	22.2	135.2
6.170	-1281.2	-0.0	29.5	25.5	135.2
6.420	-1337.5	-0.0	36.9	28.7	135.4
6.670	-1393.9	-0.0	46.9	30.7	135.4
6.920	-1450.1	-0.0	52.5	33.1	135.4
7.170	-1507.3	-0.0	60.9	34.8	135.7
7.420	-1563.8	-0.0	69.9	36.4	135.7
7.670	-1620.2	-0.0	79.3	38.3	135.5
7.920	-1676.8	-0.0	89.3	39.9	135.1
8.170	-1732.6	-0.0	99.2	41.1	135.0
8.420	-1788.3	-0.0	109.8	41.7	134.6
8.670	-1844.2	-0.0	120.7	42.4	134.2
8.920	-1900.1	-0.0	131.4	43.2	133.9
9.170	-1955.4	-0.0	141.2	44.2	133.6
9.420	-2013.0	-0.0	152.9	45.2	133.1
9.670	-2065.4	-0.0	164.4	46.9	132.5

0.108

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1302-JUN-66 STA 62

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
9.920	-2120.0	-0.0	176.7	48.2	131.7
10.170	-2174.4	-0.0	188.3	49.6	131.0
10.420	-2227.8	-0.0	201.5	51.1	130.5
10.670	-2280.1	-0.0	213.3	52.4	129.9
10.920	-2333.9	-0.0	227.7	54.5	129.9
11.170	-2387.3	-0.0	241.2	56.8	129.7
11.420	-2439.4	-0.0	254.9	59.3	129.2
11.670	-2492.9	-0.0	270.4	61.2	128.2
11.920	-2544.0	-0.0	287.0	63.3	127.4
12.170	-2594.7	-0.0	302.3	64.5	126.6
12.420	-2645.3	-0.0	318.9	65.0	125.3
12.670	-2695.6	-0.0	335.5	64.7	124.5
12.920	-2745.7	-0.0	351.3	64.7	123.6
13.170	-2794.4	-0.0	366.0	63.8	122.5
13.420	-2842.8	-0.0	383.2	63.3	121.6
13.670	-2892.2	-0.0	399.7	63.4	120.5
13.920	-2940.5	-0.0	414.4	63.5	119.5
14.170	-2988.3	-0.0	431.8	64.0	118.9
14.420	-3035.2	-0.0	447.0	63.4	118.6
14.670	-3081.4	-0.0	463.2	62.8	117.7
14.920	-3130.1	-0.0	479.4	61.4	116.5
15.170	-3177.7	-0.0	493.5	60.4	115.4
15.420	-3222.3	-0.0	508.4	59.1	113.8
15.670	-3267.5	-0.0	523.1	57.9	112.0

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1260 FLT 63

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
-14.688	3458.5	-0.0	109.7	-0.9	134.2
-14.438	3402.5	-0.0	109.2	-1.2	134.3
-14.188	3343.0	-0.0	108.8	-1.0	134.2
-13.938	3288.7	-0.0	108.7	-0.8	134.3
-13.688	3232.1	-0.0	108.1	-0.2	134.4
-13.438	3175.5	-0.0	108.4	0.3	134.3
-13.188	3118.8	-0.0	108.6	0.7	134.5
-12.938	3061.7	-0.0	108.9	1.0	134.5
-12.688	3005.1	-0.0	109.3	1.1	134.5
-12.438	2948.3	-0.0	109.4	1.1	134.7
-12.188	2891.7	-0.0	109.6	1.1	135.0
-11.938	2834.9	-0.0	110.0	1.1	135.2
-11.688	2777.2	-0.0	110.3	1.2	135.3
-11.438	2719.8	-0.0	110.6	1.0	135.3
-11.188	2663.3	-0.0	110.8	0.5	135.2
-10.938	2606.3	-0.0	111.2	0.3	135.0
-10.688	2549.4	-0.0	111.1	0.1	135.1
-10.438	2492.2	-0.0	110.5	-0.1	135.6
-10.188	2435.1	-0.0	110.9	-0.3	135.7
-9.938	2377.8	-0.0	111.1	-0.1	135.8
-9.688	2319.7	-0.0	110.7	0.1	135.7
-9.438	2263.2	-0.0	110.7	0.1	135.6
-9.188	2205.9	-0.0	110.8	0.3	135.4

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1260 09-JUN-66 STA 8

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
-8.938	2148.7	-0.0	111.0	0.5	135.2
-8.688	2091.6	-0.0	111.1	0.6	135.3
-8.438	2034.6	-0.0	111.3	0.5	135.1
-8.188	1977.6	-0.0	111.5	0.3	135.0
-7.938	1920.7	-0.0	111.5	-0.3	135.0
-7.688	1863.8	-0.0	111.5	-1.1	135.0
-7.438	1806.8	-0.0	111.4	-2.0	135.0
-7.188	1749.9	-0.0	110.3	-3.9	134.9
-6.938	1692.8	-0.0	109.5	-6.1	135.0
-6.688	1636.0	-0.0	108.5	-8.1	135.0
-6.438	1579.3	-0.0	105.1	-10.2	135.2
-6.188	1522.1	-0.0	102.2	-12.5	135.2
-5.938	1465.1	-0.0	99.4	-14.6	135.5
-5.688	1407.9	-0.0	95.4	-15.8	135.7
-5.438	1351.0	-0.0	90.9	-17.2	135.8
-5.188	1293.6	-0.0	86.1	-18.2	136.0
-4.938	1236.5	-0.0	81.7	-18.6	136.3
-4.688	1179.3	-0.0	76.9	-19.4	136.6
-4.438	1121.8	-0.0	72.4	-20.2	137.0
-4.188	1064.0	-0.0	67.4	-21.1	137.3
-3.938	1006.3	-0.0	61.2	-21.5	137.6
-3.688	948.2	-0.0	55.8	-21.6	137.8
-3.438	890.6	-0.0	50.3	-20.7	137.9
-3.188	832.4	-0.0	45.3	-19.2	137.9
-2.938	774.4	-0.0	40.4	-17.5	137.9
-2.688	716.4	-0.0	36.4	-16.0	137.8
-2.438	658.5	-0.0	32.5	-14.9	137.9
-2.188	600.3	-0.0	29.9	-14.4	137.9
-1.938	542.5	-0.0	25.9	-13.9	138.0
-1.688	484.0	-0.0	22.5	-13.3	138.1
-1.438	426.1	-0.0	18.3	-12.8	138.3
-1.188	367.6	-0.0	16.0	-11.7	138.4
-0.938	309.5	-0.0	13.2	-10.4	138.2
-0.688	250.7	-0.0	10.6	-8.6	138.2
-0.438	192.6	-0.0	8.2	-7.3	138.3
-0.188	134.8	-0.0	6.7	-5.6	138.2
0.062	76.3	-0.0	6.2	-3.9	138.3
0.312	17.4	-0.0	5.0	-2.6	138.7
0.562	-40.4	-0.0	4.6	-1.7	139.0
0.812	-99.5	-0.0	4.3	-1.2	139.2
1.062	-158.5	-0.0	4.3	-0.7	139.5
1.312	-217.0	-0.0	4.3	-0.6	139.8
1.562	-276.3	-0.0	3.9	-0.6	139.8
1.812	-335.5	-0.0	3.8	-0.1	140.0
2.062	-394.4	-0.0	3.7	0.5	140.4
2.312	-453.3	-0.0	3.5	2.0	140.5
2.562	-513.0	-0.0	4.6	4.3	140.8
2.812	-572.8	-0.0	5.1	6.4	141.4
3.062	-632.0	-0.0	7.3	8.0	141.9
3.312	-691.8	-0.0	10.8	8.5	142.1
3.562	-752.5	-0.0	13.0	7.7	142.7
3.812	-812.3	-0.0	14.8	5.8	143.1
4.062	-872.4	-0.0	16.0	4.0	143.6

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1260 09-JUN-66 STA 8

* TIME	X	Y	ALT	R/C	TOTAL VELOCITY
* SECONDS	FEET	FEET	FEET	FT/SEC	KNOTS
* 4.312	-934.0	-0.0	16.0	3.7	143.8
* 4.562	-996.1	-0.0	16.4	4.9	144.8
* 4.812	-1055.5	-0.0	17.5	8.1	145.2
* 5.062	-1116.2	-0.0	19.7	13.0	145.7
* 5.312	-1178.3	-0.0	23.3	18.3	146.4
* 5.562	-1240.3	-0.0	29.0	24.2	146.6
* 5.812	-1302.0	-0.0	36.0	29.7	146.8
* 6.062	-1363.3	-0.0	43.6	34.9	146.7
* 6.312	-1424.1	-0.0	53.7	39.4	146.7
* 6.562	-1485.2	-0.0	63.7	44.2	146.7
* 6.812	-1546.5	-0.0	75.7	48.9	146.5
* 7.062	-1607.0	-0.0	87.9	52.8	146.1
* 7.312	-1667.4	-0.0	102.2	56.6	145.3
* 7.562	-1726.0	-0.0	117.3	60.1	144.2
* 7.812	-1785.1	-0.0	132.4	63.0	143.2
* 8.062	-1843.3	-0.0	148.3	65.6	142.4
* 8.312	-1900.2	-0.0	165.5	67.7	141.7
* 8.562	-1957.3	-0.0	182.4	69.8	140.8
* 8.812	-2014.5	-0.0	200.7	71.8	139.9
* 9.062	-2070.4	-0.0	218.3	73.5	139.1
* 9.312	-2125.9	-0.0	236.9	75.0	138.0
* 9.562	-2179.9	-0.0	256.4	76.2	136.7
* 9.812	-2234.6	-0.0	275.8	77.5	135.6
* 10.062	-2288.6	-0.0	294.8	78.2	134.5
* 10.312	-2340.9	-0.0	314.5	78.7	133.6
* 10.562	-2393.2	-0.0	334.6	79.3	132.5
* 10.812	-2445.5	-0.0	354.4	79.8	131.4
* 11.062	-2497.3	-0.0	374.4	80.2	130.5
* 11.312	-2548.7	-0.0	394.3	80.4	129.3
* 11.562	-2597.9	-0.0	414.6	80.7	128.2
* 11.812	-2648.6	-0.0	435.0	80.6	127.2
* 12.062	-2697.7	-0.0	455.0	80.6	126.5
* 12.312	-2747.0	-0.0	475.4	80.2	125.8
* 12.562	-2796.1	-0.0	495.0	79.7	125.0
* 12.812	-2845.2	-0.0	515.3	79.1	124.4
* 13.062	-2892.7	-0.0	534.9	78.5	123.5

10-JUN-66 NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1261 FLT 64

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-13.940	3466.1	-0.0	107.0	-2.5	139.7
*	-13.690	3406.6	-0.0	107.2	-2.1	143.0
*	-13.440	3345.9	-0.0	107.5	-2.1	143.9
*	-13.190	3285.1	-0.0	106.8	-2.8	143.8
*	-12.940	3225.9	-0.0	105.1	-3.1	143.9
*	-12.690	3163.3	-0.0	106.1	-2.8	144.3
*	-12.440	3101.9	-0.0	103.4	-2.1	144.8
*	-12.190	3043.1	-0.0	103.9	-1.4	145.3
*	-11.940	2980.2	-0.0	103.5	-1.7	145.0
*	-11.690	2918.8	-0.0	103.8	-0.7	145.3
*	-11.440	2857.3	-0.0	103.4	-0.9	146.0
*	-11.190	2796.7	-0.0	102.1	-1.0	145.6
*	-10.940	2734.9	-0.0	102.9	-1.4	145.8
*	-10.690	2672.5	-0.0	102.6	-1.5	145.9
*	-10.440	2612.0	-0.0	102.2	-1.8	146.1
*	-10.190	2549.7	-0.0	101.1	-2.5	146.0
*	-9.940	2488.3	-0.0	100.8	-2.5	146.1
*	-9.690	2426.7	-0.0	99.8	-2.6	146.1
*	-9.440	2365.0	-0.0	99.5	-3.0	145.9
*	-9.190	2302.8	-0.0	99.1	-3.8	145.9
*	-8.940	2242.4	-0.0	98.0	-4.6	145.9
*	-8.690	2180.2	-0.0	96.3	-5.4	145.7
*	-8.440	2118.7	-0.0	94.8	-5.7	145.6
*	-8.190	2057.4	-0.0	93.3	-4.9	145.5
*	-7.940	1996.1	-0.0	91.6	-3.9	145.3
*	-7.690	1934.9	-0.0	90.9	-2.4	145.2
*	-7.440	1873.8	-0.0	91.1	-1.1	145.0
*	-7.190	1812.0	-0.0	90.4	0.5	145.1
*	-6.940	1751.4	-0.0	91.2	1.7	145.0
*	-6.690	1690.2	-0.0	91.3	2.4	144.7
*	-6.440	1628.6	-0.0	92.6	2.7	144.5
*	-6.190	1568.0	-0.0	93.5	1.9	144.5
*	-5.940	1507.4	-0.0	94.3	0.4	144.3
*	-5.690	1446.4	-0.0	93.9	-2.0	144.3
*	-5.440	1385.5	-0.0	93.4	-5.0	144.4
*	-5.190	1324.6	-0.0	91.6	-7.9	144.6
*	-4.940	1263.3	-0.0	89.4	-10.8	144.7
*	-4.690	1202.6	-0.0	85.8	-13.9	144.8
*	-4.440	1141.4	-0.0	82.5	-16.2	144.8
*	-4.190	1080.4	-0.0	77.8	-18.3	145.0
*	-3.940	1019.4	-0.0	72.5	-20.0	145.0
*	-3.690	959.0	-0.0	67.8	-21.3	145.3
*	-3.440	897.1	-0.0	62.0	-21.6	145.5
*	-3.190	836.7	-0.0	56.1	-21.9	145.5
*	-2.940	774.6	-0.0	50.9	-21.5	145.6
*	-2.690	713.7	-0.0	45.7	-20.5	145.4
*	-2.440	652.9	-0.0	39.8	-19.5	145.5
*	-2.190	591.5	-0.0	35.7	-18.8	145.5
*	-1.940	530.6	-0.0	31.3	-18.1	146.1
*	-1.690	469.1	-0.0	26.9	-16.9	146.4
*	-1.440	407.0	-0.0	22.5	-16.2	146.4
*	-1.190	344.8	-0.0	17.9	-14.6	146.5

NORTH 40 SPACE POSITIONING PROGRAM
LJC 5055 DROP NUMBER 1261-JUN-66 STA 82

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
-0.940	283.6	-0.0	15.1	-12.2	146.4
-0.690	222.4	-0.0	11.7	-9.2	146.0
-0.440	160.1	-0.0	9.9	-6.0	146.0
-0.190	98.4	-0.0	9.0	-6.2	146.1
0.060 0.120	37.7	-0.0	7.4	-4.6	146.0
0.310	-24.6	-0.0	5.4	-3.7	146.1
0.560	-86.2	-0.0	5.6	-2.9	146.2
0.810	-147.3	-0.0	5.0	-2.2	146.7
1.060	-210.0	-0.0	4.5	-1.4	147.0
1.310	-271.5	-0.0	4.3	-1.1	147.5
1.560	-334.3	-0.0	3.2	0.0	147.7
1.810	-396.8	-0.0	3.9	0.6	148.0
2.060	-459.2	-0.0	4.2	1.4	148.9
2.310	-521.1	-0.0	5.4	2.5	148.4
2.560	-584.8	-0.0	4.8	3.7	148.6
2.810	-649.4	-0.0	6.1	5.3	148.7
3.060	-708.8	-0.0	7.5	6.6	148.7
3.310	-772.8	-0.0	10.2	7.6	148.7
3.560	-835.5	-0.0	12.6	6.4	149.2
3.810	-898.2	-0.0	14.3	4.4	150.3
4.060	-962.2	-0.0	15.3	2.8	150.4
4.310	-1026.1	-0.0	14.4	2.1	151.3
4.560	-1089.2	-0.0	14.1	2.6	151.7
4.810	-1153.3	-0.0	15.7	5.0	152.2
5.060	-1218.8	-0.0	16.9	9.0	152.9
5.310	-1282.2	-0.0	18.8	13.7	153.2
5.560	-1347.6	-0.0	23.0	18.6	153.9
5.810	-1412.6	-0.0	28.5	24.8	154.2
6.060	-1475.8	-0.0	35.3	31.4	154.4
6.310	-1542.8	-0.0	43.4	38.1	153.9
6.560	-1606.9	-0.0	54.8	45.0	153.4
6.810	-1669.5	-0.0	66.4	52.2	153.3
7.060	-1732.3	-0.0	80.3	58.8	152.4
7.310	-1795.2	-0.0	96.0	64.4	152.1
7.560	-1857.0	-0.0	113.6	69.0	151.6
7.810	-1918.3	-0.0	131.2	73.2	150.9
8.060	-1979.2	-0.0	150.1	77.1	150.2
8.310	-2038.7	-0.0	169.1	79.7	148.8
8.560	-2098.5	-0.0	190.2	81.9	144.3
8.810	-2157.6	-0.0	212.2	82.9	144.2
9.060	-2213.2	-0.0	232.2	83.9	144.5
9.310	-2297.7	-0.0	253.3	82.4	144.3
9.560	-2329.0	-0.0	273.3	81.5	144.5
9.810	-2386.6	-0.0	294.4	81.1	145.4
10.060	-2441.7	-0.0	313.9	79.4	145.1
10.310	-2498.6	-0.0	334.3	78.4	140.6
10.560	-2555.5	-0.0	354.0	77.0	139.4
10.810	-2610.0	-0.0	371.6	76.6	139.0
11.060	-2664.7	-0.0	391.4	75.5	137.7
11.310	-2719.5	-0.0	410.1	74.5	137.1
11.560	-2775.5	-0.0	429.7	74.0	136.3

09-JUL-66 NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1513 FLT 73

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-13.730	3579.3	-0.0	110.3	2.4	119.1
*	-13.480	3530.0	-0.0	111.6	3.3	117.0
*	-13.230	3481.7	-0.0	112.3	3.3	117.2
*	-12.980	3430.8	-0.0	113.7	3.1	117.4
*	-12.730	3382.0	-0.0	114.4	2.2	117.5
*	-12.480	3332.3	-0.0	115.0	1.5	117.2
*	-12.230	3282.0	-0.0	114.7	1.3	116.6
*	-11.980	3233.3	-0.0	114.8	1.2	116.8
*	-11.730	3185.0	-0.0	114.9	1.1	117.1
*	-11.480	3136.0	-0.0	116.4	1.1	117.5
*	-11.230	3085.5	-0.0	116.2	1.0	118.1
*	-10.980	3034.9	-0.0	116.0	0.5	118.8
*	-10.730	2984.6	-0.0	115.9	-0.0	119.2
*	-10.480	2935.4	-0.0	116.6	-0.9	119.1
*	-10.230	2884.9	-0.0	115.7	-1.3	119.1
*	-9.980	2833.8	-0.0	115.2	-1.7	119.1
*	-9.730	2783.6	-0.0	114.7	-2.0	119.1
*	-9.480	2733.7	-0.0	114.3	-1.7	118.8
*	-9.230	2683.9	-0.0	113.9	-1.4	118.9
*	-8.980	2633.4	-0.0	113.5	-1.5	119.2
*	-8.730	2583.1	-0.0	113.2	-1.7	119.5
*	-8.480	2532.5	-0.0	113.1	-	119.4
*	-8.230	2481.9	-0.0	112.3	-	119.5
*	-7.980	2431.5	-0.0	111.6	-1.	119.6
*	-7.730	2382.0	-0.0	111.9	-0.6	119.6
*	-7.480	2330.7	-0.0	112.1	-0.2	119.8
*	-7.230	2279.9	-0.0	111.8	-0.3	119.9
*	-6.980	2229.7	-0.0	111.8	-0.9	120.0
*	-6.730	2178.3	-0.0	111.6	-1.6	119.7
*	-6.480	2128.4	-0.0	111.0	-2.1	119.6
*	-6.230	2078.0	-0.0	110.3	-2.3	119.5
*	-5.980	2027.6	-0.0	109.6	-2.6	119.4
*	-5.730	1977.3	-0.0	108.9	-2.7	119.4
*	-5.480	1927.2	-0.0	108.7	-2.8	119.3
*	-5.230	1876.4	-0.0	107.5	-3.2	119.6
*	-4.980	1826.1	-0.0	106.7	-3.5	119.8
*	-4.730	1775.6	-0.0	106.2	-4.2	120.0
*	-4.480	1724.8	-0.0	104.6	-4.9	120.0
*	-4.230	1674.0	-0.0	104.1	-6.2	120.2
*	-3.980	1623.6	-0.0	101.9	-7.3	120.3
*	-3.730	1573.6	-0.0	100.0	-8.5	120.5
*	-3.480	1522.0	-0.0	97.3	-10.1	120.7
*	-3.230	1471.1	-0.0	95.4	-11.4	121.0
*	-2.980	1419.7	-0.0	92.1	-12.8	121.3
*	-2.730	1369.1	-0.0	88.5	-13.9	121.9
*	-2.480	1317.5	-0.0	84.7	-15.1	122.5
*	-2.230	1266.2	-0.0	80.8	-15.9	122.9
*	-1.980	1213.6	-0.0	77.2	-16.3	123.4
*	-1.730	1161.5	-0.0	72.7	-17.0	123.7
*	-1.480	1110.1	-0.0	68.2	-17.7	124.0
*	-1.230	1058.0	-0.0	64.3	-18.1	124.3
*	-0.980	1005.6	-0.0	59.1	-18.3	124.6

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5059 DROP NUMBER 1513-JUL-66 [illegible] 82

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
-0.730	953.1	-0.0	54.3	-18.6	12[illegible].4
-0.480	900.0	-0.0	50.2	-19.2	125.7
-0.230	847.5	-0.0	45.2	-18.9	126.2
0.020 0.00	793.7	-0.0	40.3	-18.9	126.6
0.270	741.0	-0.0	35.0	-18.7	127.2
0.520	687.0	-0.0	31.1	-17.5	127.6
0.770	633.2	-0.0	26.2	-15.6	127.7
1.020	579.3	-0.0	22.2	-14.0	127.9
1.270	525.5	-0.0	19.3	-12.9	127.8
1.520	471.7	-0.0	17.3	-11.4	127.9
1.770	418.0	-0.0	13.8	-10.8	128.0
2.020	369.8	-0.0	11.0	-11.0	128.1
2.270	309.6	-0.0	9.0	-10.7	127.9
2.520	255.8	-0.0	6.0	-13.4	127.5
2.770	201.7	-0.0	2.8	-11.2	127.6
3.020	148.7	-0.0	1.3	-7.9	127.7
3.270	96.4	-0.0	-8.8	-3.3	128.1
3.520	40.0	-0.0	-1.8	2.1	128.3
3.770	-14.1	-0.0	-0.4	7.1	128.7
4.020	-68.5	-0.0	1.4	10.8	128.6
4.270	-122.1	-0.0	4.7	7.5	128.1
4.520	-176.2	-0.0	7.6	6.0	128.2
4.770	-229.3	-0.0	8.4	2.6	128.7
5.020	-284.7	-0.0	7.8	-1.1	129.3
5.270	-338.7	-0.0	8.0	-4.0	130.0
5.520	-394.1	-0.0	5.2	-4.6	130.7
5.770	-449.2	-0.0	3.8	-3.9	131.0
6.020	-504.9	-0.0	2.2	-2.3	131.4
6.270	-560.4	-0.0	2.8	0.4	131.2
6.520	-616.0	-0.0	3.3	3.4	131.8
6.770	-671.6	-0.0	4.3	6.1	132.0
7.020	-726.2	-0.0	5.6	8.1	132.4
7.270	-783.7	-0.0	8.9	10.1	132.6
7.520	-839.0	-0.0	11.7	11.4	132.8
7.770	-895.5	-0.0	14.6	12.2	132.7
8.020	-950.9	-0.0	17.8	13.9	132.4
8.270	-1006.8	-0.0	20.9	13.7	132.2
8.520	-1061.6	-0.0	24.1	14.7	132.2
8.770	-1118.6	-0.0	29.0	15.8	132.3
9.020	-1173.0	-0.0	31.9	17.2	132.1
9.270	-1229.3	-0.0	36.8	19.1	131.8
9.520	-1285.0	-0.0	41.4	21.6	131.5
9.770	-1339.7	-0.0	46.9	24.8	131.3
10.020	-1394.2	-0.0	53.6	28.3	130.8
10.270	-1449.8	-0.0	61.5	32.0	130.6
10.520	-1503.7	-0.0	69.2	35.7	130.2
10.770	-1558.2	-0.0	79.4	39.2	129.7
11.020	-1611.5	-0.0	89.3	43.0	129.0
11.270	-1664.7	-0.0	10[illegible].5	46.3	128.2
11.520	-1717.6	-0.0	112.3	48.4	127.2
11.770	-1769.9	-0.0	126.0	50.4	126.5
12.020	-1820.6	-0.0	138.5	51.9	125.6

NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1513-JUL-66 STA 82

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
12.270	-1871.6	-0.0	151.1	53.0	124.4
12.520	-1923.2	-0.0	164.5	53.8	123.5
12.770	-1973.1	-0.0	178.5	55.1	122.7
13.020	-2021.9	-0.0	192.3	56.2	121.5
13.270	-2071.6	-0.0	206.3	57.1	120.4
13.520	-2120.1	-0.0	220.9	57.7	119.4
13.770	-2167.6	-0.0	235.4	57.9	118.5
14.020	-2215.9	-0.0	250.3	57.9	117.3
14.270	-2262.5	-0.0	264.7	57.9	116.3
14.520	-2309.7	-0.0	278.8	57.6	115.5
14.770	-2355.[illegible]	-0.0	293.1	57.4	114.4
15.020	-2401.3	-0.0	308.0	57.6	113.7
15.270	-2447.4	-0.0	321.8	55.8	112.5
15.520	-2492.2	-0.0	336.4	54.8	112.0
15.770	-2537.8	-0.0	349.8	53.6	111.1
16.020	-2581.4	-0.0	361.9	52.6	110.6
16.270	-2627.2	-0.0	375.7	50.5	109.7
16.520	-2671.2	-0.0	388.7	48.8	108.9
16.770	-2716.0	-0.0	401.0	46.9	108.2

06-JUL-66 NORTH 40 SPACE POSITIONING PROGRAM
LIC 5055 DROP NUMBER 1534 FLT 74

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
-15.498	4035.4	-0.0	107.3	3.0	136.1
-15.248	3977.5	-0.0	108.6	2.6	135.1
-14.998	3919.6	-0.0	109.2	2.3	135.8
-14.748	3862.3	-0.0	109.7	2.6	135.6
-14.498	3805.7	-0.0	110.3	2.6	135.5
-14.248	3748.7	-0.0	110.6	2.8	135.4
-13.998	3692.1	-0.0	111.6	3.0	135.2
-13.748	3633.5	-0.0	112.7	2.9	135.2
-13.498	3577.0	-0.0	113.2	2.6	135.0
-13.248	3520.7	-0.0	114.1	2.1	134.8
-12.998	3463.8	-0.0	114.3	1.2	134.1
-12.748	3406.6	-0.0	114.4	1.0	134.2
-12.498	3350.0	-0.0	115.1	1.1	134.3
-12.248	3294.6	-0.0	114.2	1.7	134.3
-11.998	3237.1	-0.0	115.2	1.9	134.3
-11.748	3180.1	-0.0	116.1	1.9	134.2
-11.498	3123.5	-0.0	117.0	1.8	134.3
-11.248	3067.1	-0.0	117.0	1.0	133.9
-10.998	3011.[illegible]	-0.0	117.[illegible]	0.1	133.7
-10.748	2954.2	-0.0	116.8	-0.7	133.7
-10.498	2898.0	-0.0	117.0	-1.1	133.5
-10.248	284[illegible].4	-0.0	116.4	-1.4	132.7
-9.998	2765.3	-0.0	115.9	-1.5	133.7
-9.748	2729.5	-0.0	115.4	-1.4	133.5
-9.498	2671.8	-0.0	115.1	-1.4	133.6
-9.248	2615.9	-0.0	115.0	-1.4	133.8
-8.998	2560.2	-0.0	114.9	-1.3	133.5

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1534-JUL-66 STA 82

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-8.748	2503.3	-0.0	114.0	-1.1	133.0
*	-8.498	2446.5	-0.0	113.7	-1.2	133.2
*	-8.248	2391.6	-0.0	113.6	-1.4	133.0
*	-7.998	2335.6	-0.0	113.9	-1.2	132.5
*	-7.748	2278.4	-0.0	112.9	-1.4	132.2
*	-7.498	2223.4	-0.0	112.3	-1.6	132.2
*	-7.248	2168.0	-0.0	112.4	-1.9	131.8
*	-6.998	2112.4	-0.0	111.8	-1.6	131.4
*	-6.748	2056.8	-0.0	111.3	-1.5	131.5
*	-6.498	2001.3	-0.0	110.7	-1.7	131.2
*	-6.248	1945.9	-0.0	110.7	-1.2	131.2
*	-5.998	1890.7	-0.0	110.4	-1.3	130.7
*	-5.748	1836.0	-0.0	109.6	-1.2	130.4
*	-5.498	1779.8	-0.0	110.2	-1.4	130.5
*	-5.248	1726.3	-0.0	109.1	-2.3	130.4
*	-4.998	1671.0	-0.0	109.1	-3.6	130.3
*	-4.748	1615.2	-0.0	108.4	-5.5	130.0
*	-4.498	1560.9	-0.0	106.1	-7.3	130.3
*	-4.248	1506.1	-0.0	104.3	-9.6	130.3
*	-3.998	1451.5	-0.0	101.5	-11.5	130.3
*	-3.748	1396.0	-0.0	98.4	-13.0	130.8
*	-3.498	1340.8	-0.0	94.9	-14.8	131.0
*	-3.248	1286.2	-0.0	91.1	-15.8	131.3
*	-2.998	1230.2	-0.0	86.7	-16.7	131.2
*	-2.748	1175.6	-0.0	81.9	-17.9	131.3
*	-2.498	1119.7	-0.0	78.3	-18.6	131.7
*	-2.248	1064.8	-0.0	73.4	-19.3	131.8
*	-1.998	1009.9	-0.0	67.8	-20.0	132.2
*	-1.748	953.3	-0.0	63.2	-20.7	132.3
*	-1.498	897.8	-0.0	57.7	-20.6	132.5
*	-1.248	842.0	-0.0	52.4	-20.4	132.5
*	-0.998	786.7	-0.0	47.4	-20.5	132.4
*	-0.748	731.1	-0.0	42.5	-20.1	132.5
*	-0.498	675.3	-0.0	37.4	-19.5	132.5
*	-0.248	619.3	-0.0	32.2	-18.6	132.7
*	0.002 0.225	563.6	-0.0	27.5	-17.6	132.6
*	0.252	508.4	-0.0	23.6	-15.7	132.5
*	0.502	451.5	-0.0	19.9	-14.1	132.5
*	0.752	396.5	-0.0	15.9	-12.3	132.5
*	1.002	340.8	-0.0	14.1	-10.8	132.5
*	1.252	284.4	-0.0	10.7	-9.2	132.6
*	1.502	228.8	-0.0	9.3	-8.4	132.6
*	1.752	173.2	-0.0	7.3	-7.8	132.2
*	2.002	116.1	-0.0	5.9	-6.4	131.9
*	2.252	61.7	-0.0	2.9	-6.3	131.6
*	2.502	6.7	-0.0	2.3	-5.2	131.6
*	2.752	-49.6	-0.0	2.0	-4.5	131.3
*	3.002	-104.3	-0.0	-0.5	-2.8	131.6
*	3.252	-160.8	-0.0	-0.4	-2.1	132.0
*	3.502	-215.7	-0.0	-1.5	-1.0	132.0
*	3.752	-271.2	-0.0	-0.3	-0.3	131.7
*	4.002	-328.2	-0.0	-0.8	-1.0	131.2

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1534-JUL-66 STA 82

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
4.252	-383.2	-0.0	-0.3	-1.1	129.5
4.502	-437.3	-0.0	-1.5	-1.7	129.3
4.752	-492.4	-0.0	-2.6	-1.4	128.9
5.002	-542.0	-0.0	-2.2	-0.3	129.3
5.252	-601.3	-0.0	-2.5	0.7	129.7
5.502	-655.6	-0.0	-2.3	2.2	130.2
5.752	-710.5	-0.0	-0.6	3.3	131.0
6.002	-764.7	-0.0	-1.2	4.0	129.9
6.252	-820.5	-0.0	1.2	3.1	129.9
6.502	-875.5	-0.0	2.6	2.2	130.3
6.752	-929.5	-0.0	2.8	1.1	130.6
7.002	-984.2	-0.0	1.5	-0.4	130.6
7.252	-1041.0	-0.0	2.2	-1.6	131.3
7.502	-1095.9	-0.0	1.1	-0.9	132.0
7.752	-1151.0	-0.0	1.5	1.0	132.1
8.002	-1207.9	-0.0	-0.2	3.5	131.9
8.252	-1263.4	-0.0	2.1	7.4	131.9
8.502	-1318.8	-0.0	4.3	11.5	131.6
8.752	-1374.2	-0.0	8.1	15.9	131.4
9.002	-1429.2	-0.0	12.5	19.1	131.0
9.252	-1484.0	-0.0	18.0	22.7	130.9
9.502	-1540.2	-0.0	23.5	26.2	130.6
9.752	-1599.1	-0.0	30.5	29.9	130.3
10.002	-1648.7	-0.0	38.6	33.9	129.8
10.252	-1702.3	-0.0	47.8	37.5	129.3
10.502	-1756.1	-0.0	57.3	40.0	129.2
10.752	-1808.9	-0.0	68.7	42.5	128.2
11.002	-1862.1	-0.0	79.3	43.9	127.8
11.252	-1915.2	-0.0	89.7	45.2	127.3
11.502	-1966.3	-0.0	102.5	46.6	127.0
11.752	-2019.3	-0.0	113.2	49.5	126.7
12.002	-2071.2	-0.0	125.4	50.7	125.7
12.252	-2129.2	-0.0	138.9	51.9	124.8
12.502	-2174.0	-0.0	154.3	53.3	123.4
12.752	-2222.8	-0.0	165.1	53.5	121.8
13.002	-2272.9	-0.0	179.4	54.2	120.8
13.252	-2321.3	-0.0	192.8	55.0	120.2
13.502	-2369.2	-0.0	205.9	57.0	119.5
13.752	-2418.8	-0.0	221.7	57.9	118.8
14.002	-2466.9	-0.0	236.0	59.0	118.2
14.252	-2512.3	-0.0	250.6	59.6	117.1
14.502	-2561.1	-0.0	265.5	59.9	116.9
14.752	-2606.7	-0.0	280.9	60.2	115.5

11-JUL-66 NORTH 40 SPACE POSITIONING PROGRAM

LIC 3055 DROP NUMBER 1623 FLT 77

*	TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
*	-18.500	4483.7	-0.0	99.9	0.2	141.8
*	-18.250	4426.2	-0.0	100.8	-0.1	141.6
*	-18.000	4364.2	-0.0	100.7	0.3	141.6
*	-17.750	4305.9	-0.0	100.1	4.6	141.3
*	-17.500	4245.8	-0.0	100.8	6.3	142.0
*	-17.250	4185.5	-0.0	101.7	7.4	142.6
*	-17.000	4126.7	-0.0	110.3	6.9	144.0
*	-16.750	4065.8	-0.0	109.1	4.9	144.8
*	-16.500	4002.7	-0.0	108.6	1.5	145.3
*	-16.250	3940.9	-0.0	108.1	-2.1	145.3
*	-16.000	3879.9	-0.0	107.7	-1.8	144.1
*	-15.750	3819.5	-0.0	107.3	-1.7	142.3
*	-15.500	3759.9	-0.0	106.8	-1.6	140.7
*	-15.250	3700.9	-0.0	106.5	-1.5	139.1
*	-15.000	3642.5	-0.0	106.1	-1.5	137.6
*	-14.750	3584.8	-0.0	105.7	-1.0	137.6
*	-14.500	3527.8	-0.0	105.4	-1.3	138.0
*	-14.250	3471.0	-0.0	105.1	-1.4	138.7
*	-14.000	3409.5	-0.0	105.6	-1.2	140.5
*	-13.750	3350.5	-0.0	103.9	-0.9	142.6
*	-13.500	3291.9	-0.0	103.9	-0.7	143.6
*	-13.250	3228.9	-0.0	104.2	-1.1	143.8
*	-13.000	3166.5	-0.0	104.5	-1.4	144.4
*	-12.750	3107.9	-0.0	104.0	-2.7	144.3
*	-12.500	3046.6	-0.0	102.7	-2.8	141.8
*	-12.250	2985.8	-0.0	101.4	-2.5	139.8
*	-12.000	2925.3	-0.0	100.1	-1.9	138.6
*	-11.750	2871.9	-0.0	101.6	-0.9	137.8
*	-11.500	2813.5	-0.0	101.0	0.4	139.9
*	-11.250	2755.0	-0.0	100.5	1.3	141.4
*	-11.000	2694.6	-0.0	100.9	1.7	142.3
*	-10.750	2627.4	-0.0	102.3	1.9	141.6
*	-10.500	2571.5	-0.0	102.7	2.2	140.6
*	-10.250	2515.6	-0.0	103.8	1.8	139.6
*	-10.000	2457.1	-0.0	102.7	1.5	139.3
*	-9.750	2397.3	-0.0	104.0	2.0	138.8
*	-9.500	2336.4	-0.0	103.9	2.3	138.6
*	-9.250	2274.3	-0.0	104.9	3.0	138.3
*	-9.000	2225.6	-0.0	106.1	2.8	138.4
*	-8.750	2164.0	-0.0	106.7	2.8	139.1
*	-8.500	2104.3	-0.0	107.2	2.5	140.7
*	-8.250	2043.7	-0.0	107.7	2.3	143.2
*	-8.000	1983.3	-0.0	108.3	2.8	142.2
*	-7.750	1922.4	-0.0	108.9	3.3	141.8
*	-7.500	1863.3	-0.0	109.6	3.3	140.9
*	-7.250	1805.8	-0.0	111.2	3.1	140.2
*	-7.000	1744.6	-0.0	112.2	2.7	139.7
*	-6.750	1687.2	-0.0	112.2	1.9	123.6
*	-6.500	1627.7	-0.0	112.6	1.0	129.2
*	-6.250	1569.3	-0.0	112.9	0.6	134.6
*	-6.000	1573.4	-0.0	112.8	-0.1	140.5
*	-5.750	1450.3	-0.0	112.9	-1.2	145.8

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1623-JUL-66 STA 82

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
-5.500	1391.2	-0.0	113.0	-3.6	151.3
-5.250	1331.2	-0.0	111.6	-5.9	156.5
-5.000	1275.0	-0.0	110.6	-8.7	140.7
-4.750	1213.3	-0.0	106.4	-12.4	141.2
-4.500	1154.8	-0.0	104.1	-15.5	141.7
-4.250	1093.8	-0.0	100.3	-18.1	142.3
-4.000	1033.5	-0.0	93.8	-20.1	142.4
-3.750	973.8	-0.0	88.7	-22.9	142.9
-3.500	914.1	-0.0	83.7	-23.7	142.7
-3.250	854.6	-0.0	76.9	-24.4	142.8
-3.000	793.0	-0.0	69.7	-25.6	142.9
-2.750	734.4	-0.0	65.0	-25.8	143.1
-2.500	674.0	-0.0	57.2	-25.5	143.3
-2.250	614.5	-0.0	50.5	-25.6	143.3
-2.000	553.8	-0.0	45.3	-25.7	143.8
-1.750	493.7	-0.0	38.4	-25.1	144.1
-1.500	433.2	-0.0	31.7	-24.2	144.5
-1.250	372.3	-0.0	26.0	-22.4	144.4
-1.000	311.2	-0.0	19.7	-20.0	144.4
-0.750	250.3	-0.0	15.3	-17.5	146.1
-0.500	190.1	-0.0	12.4	-14.9	146.9
-0.250	129.1	-0.0	8.2	-12.1	145.4
0.000	61.8	-0.0	5.0	-10.0	145.1
0.250	1.6	-0.0	3.4	-7.7	143.5
0.500	-52.2	-0.0	1.8	-5.5	141.8
0.750	-116.5	-0.0	0.7	-3.0	141.0
1.000	-172.9	-0.0	0.5	-1.1	141.6
1.250	-233.3	-0.0	-0.7	0.1	142.3
1.500	-296.7	-0.0	1.1	0.7	141.6
1.750	-354.0	-0.0	1.7	1.5	141.8
2.000	-413.0	-0.0	1.1	1.7	141.5
2.250	-473.9	-0.0	1.2	0.9	141.8
2.500	-532.3	-0.0	2.8	0.3	142.6
2.750	-593.6	-0.0	2.2	0.0	143.9
3.000	-655.5	-0.0	2.4	-0.7	143.4
3.250	-713.9	-0.0	1.4	-1.4	170.4
3.500	-776.2	-0.0	1.3	-2.2	160.7
3.750	-836.0	-0.0	1.0	-2.0	151.5
4.000	-1001.4	-0.0	0.6	-1.5	142.5
4.250	-955.9	-0.0	-1.6	-0.9	132.8
4.500	-1016.4	-0.0	-0.2	0.7	124.5
4.750	-1075.3	-0.0	-0.2	2.3	116.0
5.000	-1134.6	-0.0	0.1	3.6	144.3
5.250	-1197.6	-0.0	2.4	4.7	144.3
5.500	-1256.9	-0.0	3.2	5.8	144.8
5.750	-1322.0	-0.0	3.7	5.7	144.8
6.000	-1379.5	-0.0	7.2	5.1	144.7
6.250	-1440.6	-0.0	8.2	4.8	145.0
6.500	-1502.0	-0.0	8.4	3.1	144.1
6.750	-1564.6	-0.0	9.4	0.9	145.0
7.000	-1625.1	-0.0	10.1	0.4	144.0
7.250	-1684.7	-0.0	8.4	0.7	143.6

NORTH 40 SPACE POSITIONING PROGRAM

LIC 5055 DROP NUMBER 1623-JUL-66 STA 62

TIME SECONDS	X FEET	Y FEET	ALT FEET	R/C FT/SEC	TOTAL VELOCITY KNOTS
7.500	-1747.2	-0.0	8.5	1.4	143.4
7.750	-1804.5	-0.0	9.4	3.5	142.7
8.000	-1866.7	-0.0	10.5	8.2	143.8
8.250	-1928.3	-0.0	12.1	11.9	144.1
8.500	-1984.4	-0.0	15.8	15.4	145.7
8.750	-2050.7	-0.0	21.8	18.3	146.5
9.000	-2110.7	-0.0	28.2	20.9	146.8
9.250	-2173.6	-0.0	33.5	21.4	147.6
9.500	-2236.5	-0.0	38.9	21.6	145.9
9.750	-2295.4	-0.0	43.6	22.5	146.3
10.000	-2358.5	-0.0	47.7	23.3	145.3
10.250	-2417..	-0.0	54.0	24.1	144.9
10.500	-2481.4	-0.0	60.2	25.0	145.3
10.750	-2539.3	-0.0	66.8	27.5	145.0
11.000	-2600.3	-0.0	73.4	29.4	145.1
11.250	-2662.7	-0.0	80.5	31.7	144.1
11.500	-2722.6	-0.0	89.7	33.8	145.2
11.750	-2782.4	-0.0	98.3	36.4	144.6
12.000	-2841.3	-0.0	107.9	37.5	143.3
12.250	-2905.1	-0.0	116.8	38.3	143.1
12.500	-2962.6	-0.0	128.0	39.8	142.3
12.750	-3019.3	-0.0	136.2	41.4	141.9
13.000	-3080.0	-0.0	147.1	42.5	140.9
13.250	-3137.3	-0.0	158.4	44.0	140.8
13.500	-3197.*	-0.0	170.4	46.3	141.9
13.750	-3255.2	-0.0	180.4	47.9	141.1
14.000	-3311.1	-0.0	193.5	49.5	140.8
14.250	-3374.7	-0.0	205.9	51.3	139.1
14.500	-3428.9	-0.0	219.4	53.9	138.8
14.750	-3485.5	-0.0	232.8	55.2	137.9
15.000	-3539.3	-0.0	246.5	56.5	137.1
15.256	-3598.0	-0.0	262.0	56.6	111.4
15.500	-3652.8	-0.0	275.9	55.8	93.5
15.750	-3711.5	-0.0	290.4	57.7	109.0
16.000	-3658.8	-0.0	303.2	59.0	124.5
16.250	-3712.5	-0.0	315.8	60.7	139.6
16.500	-3868.6	-0.0	336.2	61.8	155.6
16.750	-3924.2	-0.0	351.1	61.1	173.4
17.000	-3972.2	-0.0	366.1	61.3	156.8
17.250	-4027.4	-0.0	381.0	58.4	130.4

APPENDIX V

ANALOG COMPUTER SIMULATION OF C-130E LAPES/GPES OPERATION

INTRODUCTION

An analog-computer simulation with three-degrees-of-freedom was generated for purposes of representing a C-130E engaged in low-altitude cargo delivery operations. This simulation was intended for use by Performance Engineering (FTTEE-3) as a tool to assist them in the execution of their flight test program. It was used primarily to investigate expected aircraft response during extraction under the various proposed combinations of aircraft cg, cargo gross weight and location in the aircraft, and extracting force. The purpose in doing this was to identify potential problem areas wherein the aircraft might exceed its load-factor limits, approach stalling angle-of-attack, or tend to be flown into the ground during the course of extracting the cargo from the aircraft.

DISCUSSION

The analog simulation generated had three-degrees-of-freedom; horizontal translation, vertical translation, and pitch-axis rotation. Properly, it should really be considered a two and one-half degree-of-freedom simulation, for the dynamic pressure ($\bar{q} = \rho V_m^2/2$) was considered to be constant at the value for initial conditions (trim airspeed and altitude) and not allowed to change as a problem variable. Provision was made for the extraction of single or dual loads. The simulation allowed for the aircraft being in-ground-effect and with the landing gear down and the wing flaps extended 50 percent. Additionally, effects were included for varying extraction parachute force, cargo gross weight and cg location, as well as aircraft cg location.

The analog computer was set up to solve the equations of motion (three-degrees-of-freedom) in a stability-axis reference system. The basic equations which were used in this computation are:

X Translation

$$\text{I.} \quad \frac{W_a}{g}\dot{V} = -W_a \sin\gamma + T\cos(\alpha + i_t) - D + N\sin\alpha$$

Z Translation

$$\text{II.} \quad -\frac{W_a}{g}V\dot{\gamma} = -L + W_a\cos\alpha - T\sin(\alpha + i_t) + N\cos\alpha$$

Pitch Axis Rotation

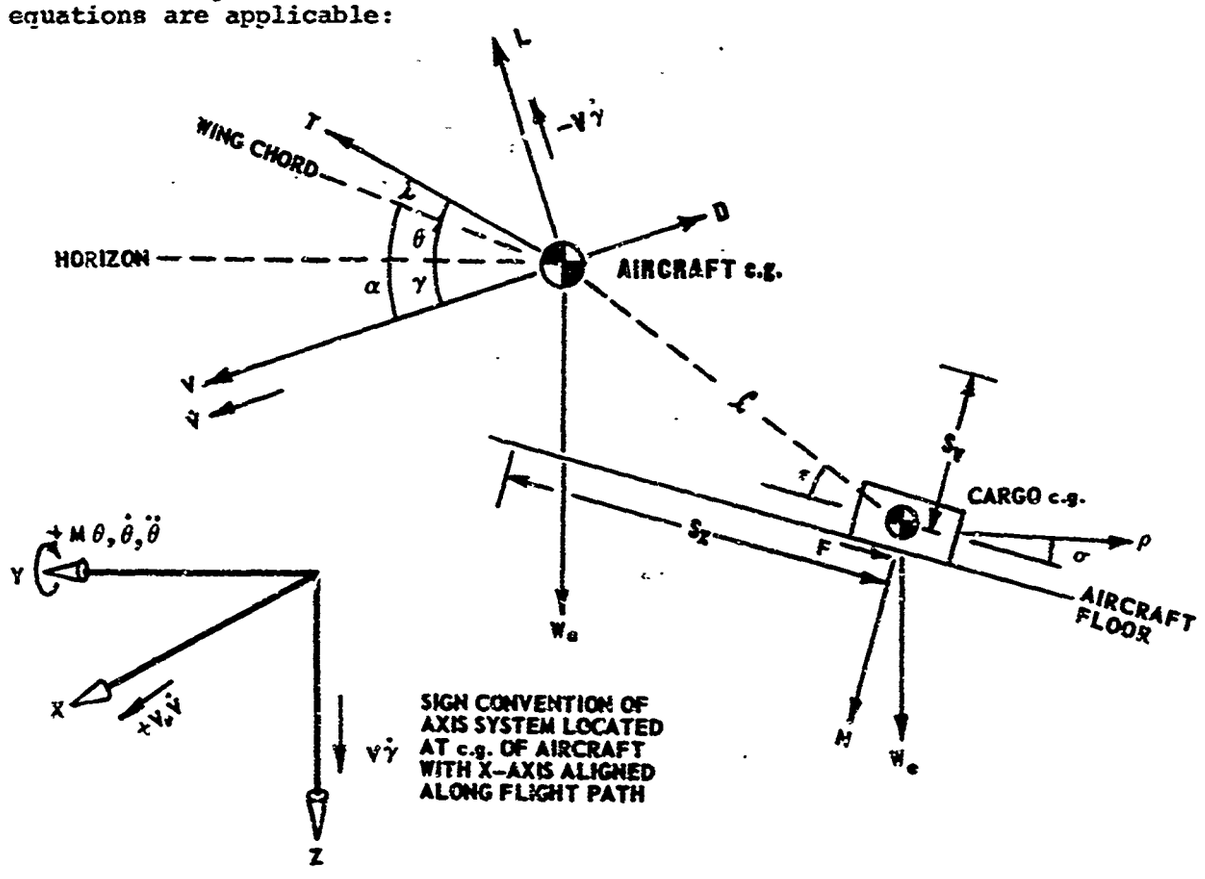
III. $I_y\ddot{\theta} = M_{aero} + N\ell\cos\varepsilon$

IV. $M_{aero} = \frac{\rho V^2 S\bar{c}}{2} C_{m_0} + \frac{\rho V S\bar{c}}{2} C_{m_\alpha}\alpha + \frac{\rho S\bar{c}^2}{2} C_{m_{\dot{\alpha}}}\dot{\alpha} + \frac{\rho S V\bar{c}^2}{4} C_{m_q}\dot{\theta}$

$+ \frac{\rho V^2 S\bar{c}}{2} C_{m_{\delta e}}\delta e$

V. $N = \frac{W_c}{g}(g\cos\theta - \ell\dot{\theta}\cos\varepsilon - \dot{V}\sin\alpha + V\dot{\gamma}\cos\alpha + \ell\dot{\theta}^2\sin\varepsilon - 2\dot{s}_x\dot{\theta})$

The following sketch illustrates the physical system of aircraft and cargo for which the above equations are applicable:



Nomenclature:

F = Friction force on floor from cargo

N = Normal force on floor from cargo

L = Lift $= \rho V_T^2 S C_L/2$

D = Drag $= \rho V_T^2 S C_D/2$

T = Propeller thrust

W_a = Weight of aircraft

W_e = Weight of cargo

s_x, s_y, ℓ = Location of cargo at any time, t, with respect to the aircraft cg

V = velocity of aircraft

$\dot{V}$ = Acceleration along the flight path

$-V\dot{\gamma}$ ≈ Accelera ..n normal to flight path

α, $\dot{\alpha}$ = Angle of attack and rate of change of angle of attack

$\theta, \dot{\theta}, \ddot{\theta}$ = Pitch attitude, rate, and acceleration

γ, $\dot{\gamma}$ = Flight path inclination relative to horizontal and rate of change

i_t = Propeller thrust angle relative to wing chord

M = Pitching moment

P = Extraction force

σ = Inclination of P relative to aircraft floor

$\bar{c}$ = Mean aerodynamic chord

δe = Elevator deflection

ε = $\cos\left(\frac{Sx}{\ell}\right)$

S = Wing area

ρ = Air density at trim conditions

$C_{m_O}, C_{m_\alpha}, C_{m_{\delta e}}, C_{m_{\dot{\alpha}}}, C_{m_q}$ = Stability derivatives

Equations I through V are the basic analytical expressions used as the foundation for the analog computer; however, they have been simplified in the actual mechanization through approximations involving small angle assumptions ($\cos u \approx 1$, $\sin u \approx u$ for $u < 15°$) and elimination of terms producing second order (relatively unimportant) effects.

Of importance in this simulation is the concept required for computing the translational and angular motion of the aircraft. Normally, in dealing with an aircraft carrying cargo, the center of gravity of cargo and aircraft are computed as a combined system, including their collective moment of inertia about the system center of gravity. Motion of the system is then computed about this point. This is a valid procedure so long as the cargo is firmly fixed to the aircraft, for then the two items are components of a rigid-body system. Such is not the case in extraction of the object from the vehicle. Consequently, the motion of the aircraft during cargo extraction was computed about the center of gravity of the aircraft only, with inertial and gravitational forces of the cargo seen as disturbing influences in the same fashion as forces created by elevator inputs or by gusts.

A functional schematic of the analog simulation used to calculate the motion of the C-130E during

LAPES and GPES operations is shown in figure 3. A comparison of calculated and actual performance of the aircraft is shown in figures 1 and 2. In general, it has been found that the elevator effectiveness ($C_{m_{\delta e}}$) from reference 12 had to be increased about fifteen percent in order to secure the degree of correlation seen.

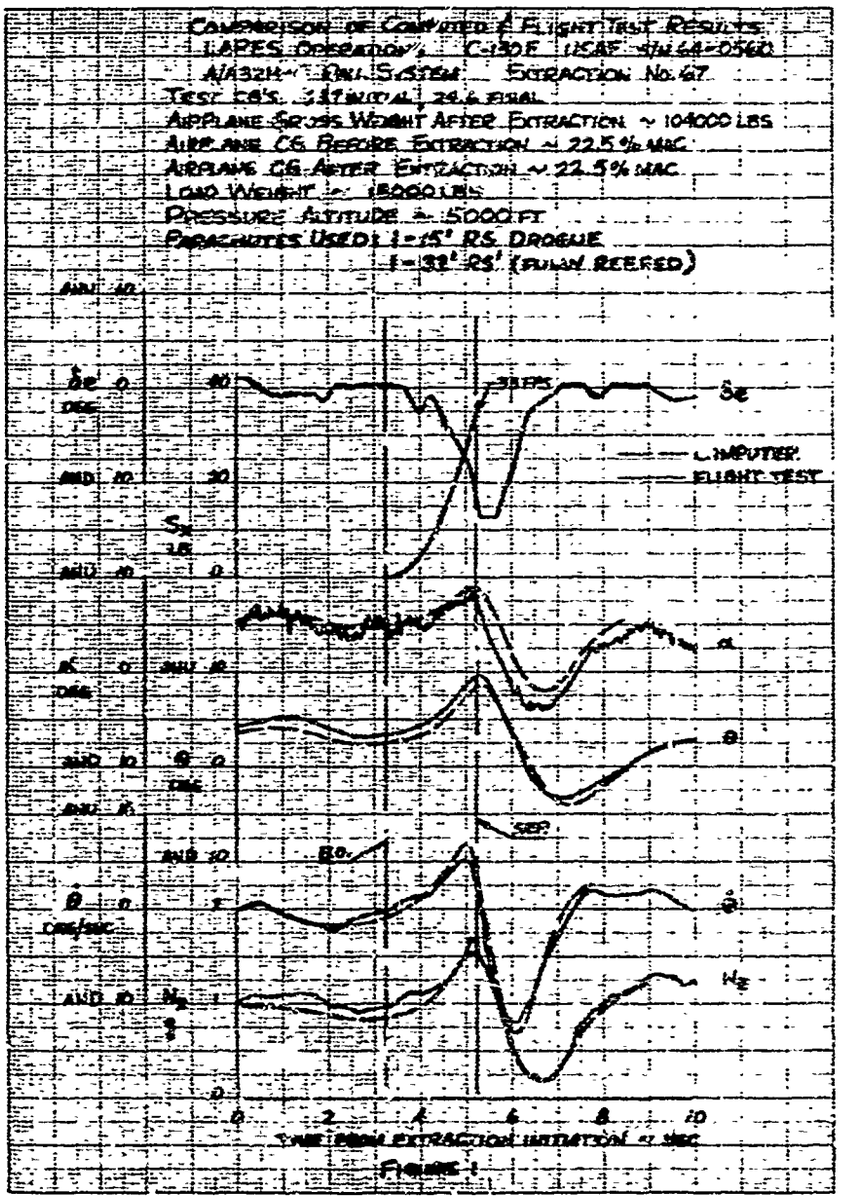


FIGURE 1

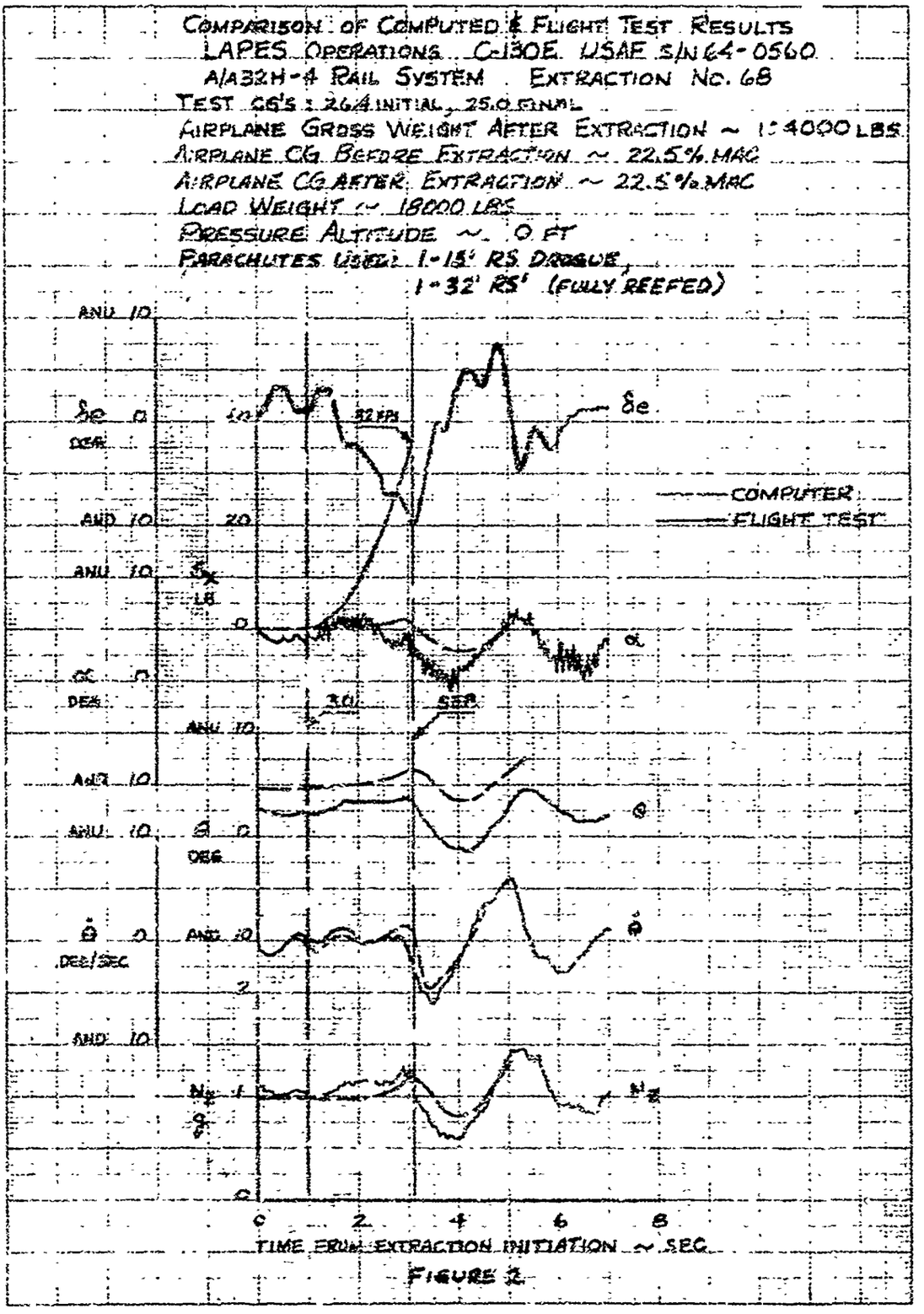
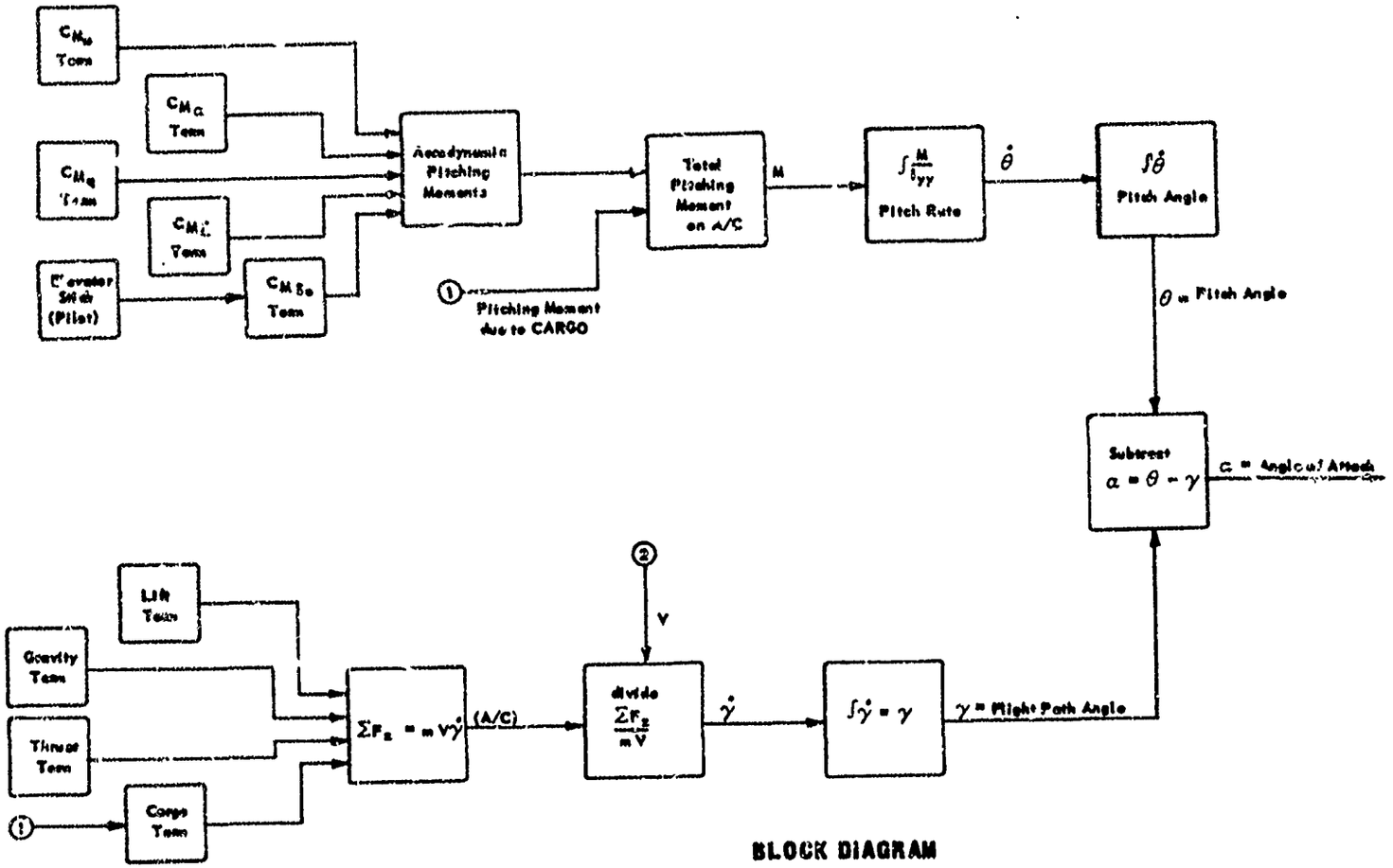

COMPARISON OF COMPUTED & FLIGHT TEST RESULTS
LAPES OPERATIONS C-130E USAF S/N 64-0560
A/A32H-4 RAIL SYSTEM EXTRACTION NO. 68
TEST CG'S : 26.4 INITIAL, 25.0 FINAL
AIRPLANE GROSS WEIGHT AFTER EXTRACTION ~ 114000 LBS
AIRPLANE CG BEFORE EXTRACTION ~ 22.5% MAC
AIRPLANE CG AFTER EXTRACTION ~ 22.5% MAC
LOAD WEIGHT ~ 18000 LBS
PRESSURE ALTITUDE ~ 0 FT
PARACHUTES USED: 1-15' RS DROGUE,
1-32' RS' (FULLY REEFED)
COMPUTER
FLIGHT TEST
δe
α
q
θ̇
Nz
32 FPS
30 SEC
TIME FROM EXTRACTION INITIATION ~ SEC

FIGURE 2.

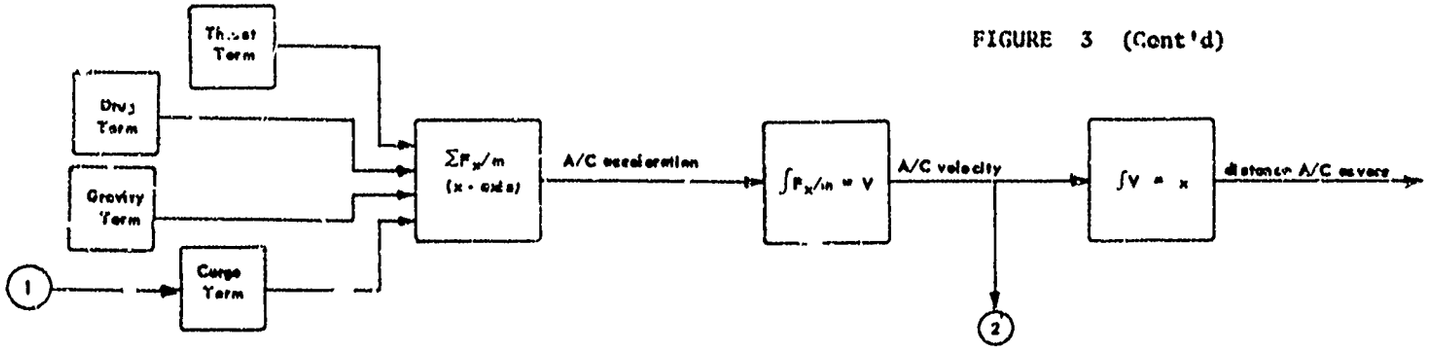


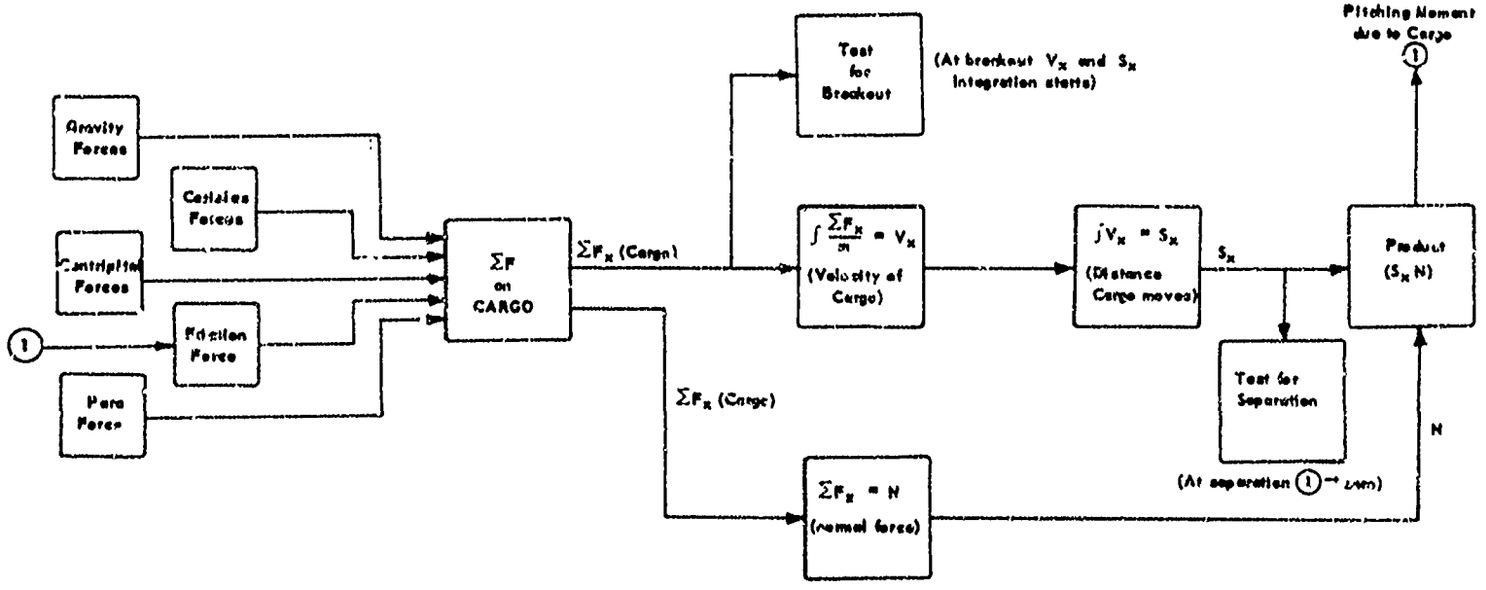
BLOCK DIAGRAM
C-130E (LAPES) ANALOG SIMULATION

FIGURE 3

BLOCK DIAGRAM
C-130E (LAPES) ANALOG SIMULATION

FIGURE 3 (Cont'd)





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1. ORIGINATING ACTIVITY (Corporate author)	2a. REPORT SECURITY CLASSIFICATION
Air Force Flight Test Center Edwards AFB, California	UNCLASSIFIED
	2b GROUP N/A

3. REPORT TITLE Evaluation of the C-130E Stability and Control Characteristics and the A/A32H-4 Dual Rail Cargo Handling System During Low Level Cargo Deliveries

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Final Flight Test Report

5. AUTHOR(S) *(Last name, first name, initial)*

Martin, Kenneth L., Project Engineer
Ramirez, Raymond E., Project Engineer
Franzen, Ronald V., Project Pilot

6. REPORT DATE	7a TOTAL NO. OF PAGES	7b. NO. OF REFS
March 1967	384	12

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
b. PROJECT NO.	FTC-TR-66-43
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13. ABSTRACT

The purpose of these tests was to determine the stability and control characteristics of the C-130E and the suitability of the A/A32H-4 Dual Rail Cargo Handling System while performing low level (ground proximity) cargo deliveries. The test program consisted of 48 low altitude extraction system (LAPES) deliveries and 27 ground proximity extraction system (GPES) deliveries. The maximum single and total load LAPES deliveries executed were 25 000 and 28 000 pounds, respectively. The maximum GPES delivery was 25 000 pounds. No unsatisfactory stability and control characteristics were encountered at speeds above 1.2 times the power-off stalling speed. It is recommended that the C-130E and the A/A32H-4 Dual Rail Cargo Handling System be cleared for LAPES and GPES deliveries of up to 25 000 pounds gross weight, with the limitations outlined in this report. A new table of variable-restraint right-hand rail locks settings for LAPES and GPES missions are provided in this report.

DD FORM 1 JAN 64 1473

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
C-130E Airplane A/A32H-4 Dual Rail Cargo Handling System Low Altitude Parachute Extraction System (LAPES) Ground Proximity Extraction System (GPES) Low Level Cargo Delivery Flight Test Stability and Control Performance						

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